

**Efficacy of different substrates on the growth,
yield and nutritional composition of oyster
mushroom (*Pleurotus florida*) under
sub-tropical conditions**

THESIS

**SUBMITTED TO THE
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
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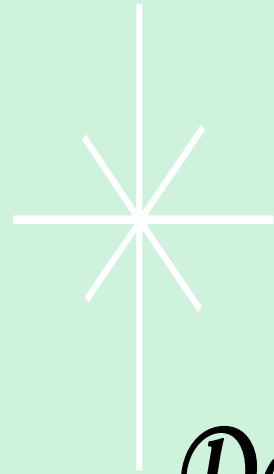
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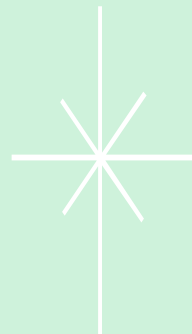
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2021



*Dedicated to
My Beloved Parents*



DECLARATION

I, **Rupesh Kumar Mandal**, hereby declare that this research work embodied in this Ph.D. thesis entitled “**Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions**” has been carried out by me under the supervision and guidance of **Dr. Rubee Lata**, Assistant Professor, Department of Horticulture, School of Agricultural Science and Technology, Babasaheb Bhimrao Ambedkar University (A Central University) Lucknow, 226025.

This Research work is an original work and it has not been previously submitted in part or full for any other degree or diploma in this or any other university. This is also declared that the thesis is essentially free from all kinds of plagiarism.

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CERTIFICATE

This is to certify that the thesis entitled “**Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions**” submitted by **Mr. Rupesh Kumar Mandal** is an original research work and has not been previously submitted in part or full for the award of any other degree or diploma to this or any other university.

This thesis submitted to Babasaheb Bhimrao Ambedkar University, Lucknow satisfies all the requirements as stipulated in the *Doctor of Philosophy (Ph.D.) regulations, 1999 as amended in 2013* and it is fit for submission and evaluation for the award of the degree of Doctor of Philosophy in Horticulture of the University.

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LIST OF ABBREVIATIONS

ANOVA	:	Analysis of variance
CD	:	Critical Difference
cm	:	centimetre
CV	:	Coefficient of variation
<i>per se</i>	:	As such with mean
<i>et al.</i>	:	et alli (and others)
Fig	:	Figure
g	:	gram
kg	:	kilogram
m	:	metre
ha	:	hectare
mg	:	milligram
SE(d)	:	Standard error difference
S.Em	:	Standard error mean
df	:	degrees of freedom
CRD	:	Completely Randomized Design
<i>viz.</i>	:	videlicet (namely)
vs.	:	versus (against)
No	:	Number
<i>i.e.</i>	:	id est (that is)

@	:	at the rate of
SS	:	Sum of Squares
MSS	:	Mean Sum of Squares
RH	:	Relative humidity
e.g.	:	exempli gratia (for example)
%	:	per cent
@	:	at the rate of
&	:	and
⁰ C	:	degree Celsius

Introduction

Mushrooms, also known as 'white vegetables' or 'boneless vegetarian meat' contains adequate level of proteins, vitamins and fiber apart from having certain valuable properties (Thakur *et al.*, 2013, Meng *et al.*, 2016). Mushroom substrates defined as any kind of lignocellulosic material which supports and enhance the growth of fruiting bodies (Chang and Miles, 1988).

Pleurotus florida white oyster mushroom is white in color from primordial head formation to maturity and this mushroom also grows in bunches. The pileus of this mushroom is with thin margins, smooth and pileus thickness is lesser as compared to *Pleurotus ostreatus* and *Pleurotus sajor-caju*. *Pleurotus ostreatus* is the second most cultivated edible mushroom worldwide after *Agaricus bisporus* (Sanchez, 2010).

With increasing food demand for the increasing population from the limited land resource is one of the biggest challenges for our Indian democracy in climate change era. India ranked in Global Hunger Index 102 out of 117 countries showed that level of malnutrition and poverty. It has been estimated as 170 million tons of crops residues left for burning and incorporation into soil out of the total 355 million tons produced annually (Tewari and Pandey, 2002). India is a largely agricultural country and producing a huge quantity of agro-wastes every year approximately 620 million tons (Singh and Sidhu, 2014).

The archeological investigation estimated as edible mushroom associated with people living 13000 years ago in Chile (Rojas and Mansur, 1995), but in context of China eating of edible fungi first noted several hundred years of birth of Christ (Aaronson, 2000). Mushroom cultivation is one of the ways to supply cheap, medicinal and nutritional source of food supplement along with conservation of natural resources. Edible mushroom is called as food of the gods and still treated as regular part of balanced diet.

Oyster mushroom production 21272 metric tonnes as been reported out of total 129782 metric tonnes (official data of 2016, ICMR-DMR). In the last five years, the mushroom production in India has almost doubled from 1.10 lakh metric tonnes to 2.01 lakh metric tones (official data of 2019, ICMR-DMR). It is popularly grown in the states of Odisha, Karnataka, Maharashtra, Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Uttar Pradesh and West Bengal and in the Northeastern States of Meghalaya, Tripura Manipur, Mizoram and Assam. This mushroom is cultivated in about 25 countries of far-east Asia, Europe and America. It is the 3rd largest cultivated mushroom in the world. The major producing countries are China, South Korea, Japan, Italy, Taiwan, Thailand and Philippines.

The fruiting bodies of this mushroom are distinctly shell, fan or spatula shaped with different shades of white, cream, grey, yellow, pink or light brown depending upon the species. However, the colour of the sporophores is extremely variable character influenced by the temperature, light intensity and nutrients present in the substrate. The name *Pleurotus* has its origin from *Greek* word. The oyster mushroom is one of the most suitable fungal organism for producing protein rich food from various agro-wastes without composting.

Out of the total 200 species of fungi has been reported all over the world only 20 of them are cultivated for their edible parts. Oyster mushrooms are large, oyster-shell shaped edible fungi species. Their chewy, flavorful, fruiting bodies are widely popular in the Chinese, Japanese and Korean cuisine. It is native to the dense forests of North America, Northern Europe, and Siberian Asia. The importance of edible mushroom has increase due to availability of low cost technology and effective use of industrial and agricultural wastes and fetches good market prices.

Unsaturated fatty acid present in mushroom ensures prevention of cardiovascular disease and cancer. As per estimates, 45% of consumption in fresh, 5% is dehydrated and rest 50% preserved by canning. India shares 10% global export and earn foreign exchange. Oyster mushrooms are modest sources of vitamin-D (ergocalciferol) at 29 µg per 100 g (7% of DA). Antioxidation property linked with ergosterol is natural precursor of vitamin D₂ which is formed due to UV light irradiation. (Shaho *et al.* 2010 and phillip *et. al.*, 2016). Vitamin-D plays a vital role in the calcium and phosphate metabolism. Oyster mushroom carries relatively high

amounts of good quality protein than other cultivated mushrooms. Fresh mushroom is an excellent source of folic acid (38 µg per 100 g). Further, they contain ample concentrations of other B-complex group of vitamins like thiamin, riboflavin, niacin, pantothenic acid, pyridoxine etc. Minerals such as copper, iron and phosphorus are present in moderate levels in this mushroom. They compose *beta-glucan* which has anti-viral and anti-allergic properties. Oyster mushroom, *Pleurotus* spp. a macro fungus with a distinctive fruiting body, is a unique biota which assembles its food by secreting degrading enzymes. The genus *Pleurotus* (oyster mushroom) is an organoleptic fast growing fungus, which decomposes the complex organic materials to generate simpler compounds for its nutrition (Chang and Miles, 1991). Mushrooms and other fleshy fungi are the premier recyclers of nutrients on the planet. Yet to date, the inherent biological power embodied within the mycelium network of mushrooms largely remains a vast, untapped resource (Stamets, 2000). Water defines the biosphere and low water availability in arid regions of the globe limits biodiversity as well as biomass (Austin *et al.*, 2004; Huxman *et al.*, 2004). Saprotrophic basidiomycete macrofungi have a worldwide distribution and play critical roles in water sequestration, animal and human nutrition, soil health and ecosystem function, particularly in water-constrained environments (McGonigle, 1995). Since centuries, mushrooms have been recognized as important food item and their usage is being increased day by day for their significant role in human health, nutritional and medicinal properties (Mshandete, 2011). *Pleurotus florida* produces metabolites of medicinal and pharmacological interest, such antioxidant antimicrobials, immune stimulants and antitumor activities (Nayana and Janardhanan, 2000; Manpreet *et al.*, 2004; Elmastas, 2007).

Among the numerous species of mushroom, oyster mushrooms (*Pleurotus florida*) are more advantages in terms of easiness in cultivation, role in biodegradation and bio-remediation, production of extracellular enzymes and nutraceuticals (Rashad *et al.*, 2009). *Pleurotus florida* on the four lignocellulosic substrates: sawdust, corn cobs, oil palm spadix and corn straw. The result showed that *Pleurotus florida* contained 26.28-29.91% protein, 86.60-89.90% moisture, 0.48-0.91% fat, 19.64-22.82% fiber, 31.37-38.17% carbohydrate and 5.18-6.39% ash. The mineral contents ranged from 17-21 mg/100 g iron, 277-359 mg/100 g sodium, 2088-2281 mg/100 g potassium, 342-410 mg/100 g calcium and 1009-1133 mg/100 g

phosphorus (Salami *et al.*, 2017). The protein content ranged between 20–30% on a dry weight basis. The nitrogen present in supplemental substrates after spawn running encourages the mushroom growth, yield and quality, in addition to promotes in bioconversion and bioaccumulation efficiency (Dias, 2003).

Mushrooms are still cultivated on small pockets on a specific substrate and yield potential is not satisfactory. In the present study, *Pleurotus* was cultivated on paddy straw, wheat straw, sugarcane trash, cardboard and banana leaves on single and mixed bed consisting of equal amounts of these substrates in polythene bags. The yields of mushroom, biological efficiency and nutrient composition of the mushrooms were analyzed. Cellulose rich organic substance has been reported to be of good substrates for the cultivation of mushrooms (Quimio, 1987). Substrates with high lignin and phenol content decreased the activity of cellulose, but less lignin would enhance enzyme activity and thus ensure high per unit of yield of mushrooms (Sivaprakasam, 1986).

For handling *Pleurotus* species, mushroom needs a basic understanding of their physical, chemical, biological and enzymatic properties. Several components affect the fruiting body formation, pin head initiation, yield, biological efficiencies and duration of oyster mushroom production along with composition of culture media, substrates, size of particles, pH, Moisture content, carbon to nitrogen ratio (C/N), Levels of spawning, spawns quality, light, temperature, humidity, aeration and favourable conditions has been followed.

The technologies related to mushroom cultivation are quite simple and low investment. It can be easily adopted by Women Self Help Group to promote rural entrepreneurship. It will encourage economic betterment of small land holding farmers, landless farmers and other marginalized sections of society (Satankar *et al.*, 2018)

The processing of mushroom is integral part of cultivation, cooled to storage temperature ranged between 0-2 °C after 5 hours of harvestings. For nearby market, wrapped with plastic film at storage temperature 8-10 °C. Drying, canning and pickling are the methods to preserve mushroom for long term by inactivating the microorganisms and reducing the moisture level. Oyster mushroom has been preserved to prepare a number of value added products. Oyster mushroom generally

contains 85-90% moisture. The dehydrated products can be easily powdered and used in several food formulation including instant soups and bakery products.

The oyster mushroom cost of cultivation is about Rs. 50/- for the production of one kg of fresh mushroom, mostly take huge share by spawn cost (Rs. 30/-). The growth, yield and quality of mushroom depends upon quality of spawn to be used in cultivation processes. The yield of mushroom is mainly depends on the quality of the spawn used. The selling price of fresh oyster mushroom in the market ranges from Rs. 90 to 150/-. The selling price depends on marketing place, quality and other various parameters. Thus, a farmer can earn a minimum of Rs. 30/- per kg of oyster mushroom produced. On an average, a farmer can generate a minimum additional income of Rs. 6,000/- per acre by cultivation of oyster mushroom generated from per acre of land (Mageshwaran *et al.*, 2017).

Keeping in view of the above facts in mind, the present investigation entitled **“Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions”** has been undertaken to generate information with the following objectives:

1. To find out the effect of different agro waste as substrates for growth of the oyster mushroom.
2. To assess the nutritional quality of the oyster mushroom grown on different substrates.
3. To investigate the best substrate for the cultivation of oyster mushroom under sub-tropical conditions.
4. To evaluate the influence of different substrates on biological efficiency of oyster mushroom.
5. To estimate the benefit: cost ratio of oyster mushroom production.

Chapter-II

Review of Literature

Oyster mushroom one of the most popular belongs to the genus *Pleurotus* and family Pleurotaceae. It is lignocellulolytic fungus naturally grow in tropical and temperate forests on dead, decaying wooden logs and organic matter. It is one of most suitable fungal organism for producing protein rich food from different agro wastes. Beside these mushroom cultivation is eco friendly enterprise and has got at least adverse effect on environment. A review of available literature has been taken up in following taken into brief as under the present investigation entitled “**Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions**”.

Jain and Vyas (2002) evaluated the effect of the wheat straw supplementation with wheat bran, rice bran or neem cake the yield of *Pleurotus florida* was evaluated under laboratory conditions (26 °C and 80-85% R.H.). Wheat straw supplemented with rice bran was most favourable substrate for *Pleurotus florida* resulting in the highest yield (910 g. basidiocarps).

Vyas *et al.* (2003) carried out a laboratory experiment to evaluate the potential use of locally available plant materials, i.e. sorghum stalk, bajra straw, moth bean stalk, rice straw, mung bean stalk, and wheat straw for *P. florida* cultivation. Wheat straw gave the earliest spawn run (17 days), first harvest (27 days) and highest total yield (985 g/ bag) and bio efficiency (98.5%).

Dias (2003) reported that wheat straw is better than paddy straw for the cultivation of Oyster mushroom. Different agricultural waste like banana pseudo stem, wheat straw, water hyacinth, congress grass for cultivation of *P. Sajor-caju* and *P. flabellatus* was also cultivated *P. florida* on wheat straw and soybean straw (1:1) to showed highest biological efficiency (93%).

Shashirekha (2005) conducted an experiment to check the effects of cotton seed powder (3%) along with rice straw substrate of oyster mushroom, while

culturing *Pleurotus florida*, increased mushroom total yield and protein content. The amount of free sugar and polymeric carbohydrates were to be recorded as the 13.2% and 39.6% in mushrooms grown on rice straw (RS-M) and 8.3% and 19.8% in the mushrooms grown on cotton seed-supplemented rice straw (CS-M). It observed that the cotton seed supplementation significantly decrease in the total dietary fibre content. 45% reduction in firmness recorded in the cotton seed-supplemented rice straw as observed on a Zenken texturometer. The free amino acids recorded increase in about 125% cotton seed-supplemented rice straw compared to the rice straw. There was a significant increase in most of the essential amino acids, such as methionine valine, leucine, isoleucine, cysteine and phenylalanine. The total protein content (Kjeldahl N · 4.38) observed as 90% increase in the cotton seed-supplemented rice straw. The total lipids increased by 35% due to cotton seed supplementation of the rice straw substrate, it showed that there was a predominance of unsaturated fatty acids and linoleic acid.

Ahmed *et al.* (2009) suggested that the yield, biological efficiencies and moisture content of the *Pleurotus florida* cultivated on different agro-wastes singly and in combination, the maximum yield was obtained on soybean straw (875.66gm/kg straw) with 87.56% biological efficiencies, followed by yield on soybean + paddy straw (852.00gm/kg straw) with 85.20% biological efficiencies.

Naraian *et al.* (2009) evaluated on cultivation Oyster mushroom *Pleurotus florida* was performed in polybags. The corn cob were in combination with urea, ammonium sulphate, gram flour, soybean meal, ground nut cake and molasses as basal substrates. Various parameters in response to mushroom *viz.*, mycelial growth, spawn running, primordial initiation, fruiting body, yield and its biological efficiency has been observed. First time primordial initiation ranged between 20.2–35.1 days. The cotton seed cake has been recorded the suitable substrates producing 93.75% biological efficiency while soybean meal has been observed as the second best additive producing 93.00% yield. The highest growth rate, rapid mycelia run, early primordial initiation, highest yield and biological efficiency were observed in the combination of corn cob and cotton seed cake at 2% (98 + 2) level.

Mondal *et al.* (2010) carried out in the mushroom cultivation to evaluate the better performance of oyster mushroom *Pleurotus florida* in different substrate in highest mycelium running rate in banana leaves and rice straw (1:1) but the lowest in control. Completion of mycelium running time was lowest in banana leaves and rice straw (1:3 and 3:1). Number of total primordia and effective primordia, found highest in control but the maximum pileus thickness was measured from rice straw. Highest biological yield and economic yield (164.4 g and 151.1 g) was obtained from rice straw which was much higher than control.

Hassan *et al.* (2010) investigated that the *Pleurotus eryngii* is an edible mushroom that highly appreciated and has a commercial potential in many countries, was newly introduced to Egypt from China. This study investigated the possibility of using some local lignocellulosic wastes as growing media. Mycelium linear growth, wheat bran supplementation level, incubation period, total yield and chemical composition of fruiting bodies were evaluated. The suitable wheat bran supplementation level for sawdust, soybean straw and rice straw media was 25%, which gave the highest mycelium linear growth being 8.9, 8.4 and 7.6 mm per day. While, the maximum mycelium linear growth on sugar cane bagasse 6.7 mm per day was achieved at 30% wheat bran level. Incubation period for the different tested media ranged from 30 to 41 days, sawdust observed the shortest span of time period, while sugarcane bagasse recorded the longest one. The maximum yield recorded as 201 g per kg wet media and biological efficiency (BE) 65.22% was obtained on sawdust. Sugarcane bagasse provide the minimum yield upto 139 g per kg wet media with biological efficiency of 45.71%. *Pleurotus eryngii* grown on different tested media taken into account the 87.63 – 90.26% moisture content, 21.33 – 24.08% crude protein, 2.96 – 3.78% ether extract and 6.54 – 8.02% ash content.

Rajak *et al.* (2011) carried out the experiment aimed to find out the efficacy of some grasses as cost effective alternative substrates, for cultivation of one species of oyster mushroom *viz.*, *Pleurotus sajor - caju* (Fr.) Singer in eastern India. Relative efficacy of three grasses *viz.*, kash grass (*Saccharum spontaneum* L.), sabai grass (*Eulaliopsis binata* C.E. Hubb (Retz.) and lemon grass (*Cymbopogon citrates* Stapf.) was evaluated by using each of them either as whole substrate or in combination with the substrate *i.e.*, paddy straw in 3:1, 1:1 and 1:3 ratios. Data findings indicate that the

highest yield was observed under paddy straw with biological efficiency of 85.9%. However, no significant difference in yield was found when 25% or 50% of the conventional substrate (paddy straw) was replaced by lemon grass and sabai grass. The results indicated that grasses which are available in plenty in the forests and wastelands of lateritic uplands of eastern India can be utilized successfully as promising substrate for the commercial cultivation of *Pleurotus sajor-caju*.

Survase (2012) found that different agricultural wastes put forward either singly Wheat straw, paddy straw, soybean straw, pigeon pea straw and green gram straw singly or combination with wheat + soybean, wheat + pigeon pea, wheat + green gram (1:1) for the production of *Pleurotus sajor-caju* (Fr.) Singer. Data revealed that maximum protein content was recorded in 29.45 and 29.35 in wheat + soybean and wheat + pigeon pea respectively. Agricultural waste may be utilized for commercial purpose and to avoid the pollution by using it in proper way. It can also help to enhance the economy of farmer as a side business to reduce the suicides of them. No land is required for cultivation of it and opportunities for self-employment

Randive (2012) found out the amount of protein in wood scrap is 21mg/ml. and protein contain for wheat straw is 15 mg/ml. lipid in grey mushroom in wheat straw was 0.710g that in paddy was 1.27g and the amount of lipid in pink mushroom in wheat straw is 2g and that in paddy is 0.37g. The moisture content of grey mushroom on wheat straw was 87.5% that on paddy straw was 77.5%. For pink mushrooms on wheat straw was 92% and in paddy straw was 86.11% Total carbohydrate content of mushroom in wood scrap was (68.6g/100gm) and wheat straw was (66.7g/100gm).

Kumari and Achal (2008) carried out the experiment to check the performances of five different substrates viz., paddy straw, wheat straw, mixture of paddy and wheat straw (1 : 1), bamboo leaves and lawn grasses on the yield and quality of Oyster mushroom (*Pleurotus ostreatus*). Among the substrates, wheat straw and a mixture of paddy and wheat straw results the earliest fungal colonization. The highest yield was observed on wheat straw (29.27 g fresh weight per kg substrate), followed by the combination of paddy and wheat straw (27.96 g fresh weight per kg substrate). Non-enzymatic antioxidant activities were also recorded by estimating

different vitamins viz. A, C and E. Vitamin E was found to be significantly in both fresh (7.23 mg/g) and dry fruit body (5.93 mg/g). All the experiments were taken into triplicates.

Rawte and Diwan (2011) carried out an experiment in different isolates species of *Pleurotus* namely, *Pleurotus florida*, *Pleurotus sajor-caju*, *Pleurotus eous*, *Pleurotus flabellatus*, *Pleurotus species* were cultured on potato dextrose agar media and maintained on potato dextrose agar slants. All the isolated species were tested for biomass production in various media i.e. Richard's Broth, Asthana Hawker's. Czapeck's Dox, Potato Dextrose Broth and Malt Extract Broth media with the basal medium in different pH level of 3.0, 4.0, 5.0, 6.0, 7.0 and 8.0 were inoculated with 1 cm disc mycelia. The maximum biomass 1.86 g was observed on Potato dextrose agar media in *Pleurotus florida*. The minimum biomass 1.15g was recorded on Asthana Hawker's media in *Pleurotus florida* and *Pleurotus eous*. All the isolated species were tested for the effect of different level of pH variations. The pH range varied from 3 to 8 was observed. The maximum biomass was found to be at 5.0 pH. The data revealed that the biomass significantly decreased in an acidic environment and higher pH also did not support the growth as well as biomass.

Jafarpour and Eghbalsaeed (2012) found that substrates viz. wheat straw, barley straw, maize stem residue and lawn residue in combination with wheat bran, rice bran and soybean powder as supplemental for the growth of *Pleurotus florida* and *Pleurotus ostreatus* as edible mushrooms. In small period of time provides higher yield and biological efficiency were reported for *Pleurotus florida* than *Pleurotus ostreatus*. Wheat and barley straws which contained high amount of fiber content and carbon to nitrogen (C:N) ratio encouraged the growth time period, increase in fruiting body weight, yield and biological efficiency. Evaluation of different substrate and their combinations showed that the maximum growing period was obtained from barley straw along with rice bran (27.00 day). However, the maximum fruiting body number (36.33), fruiting body weight (31.17 g), yield (939.33 g) and biological efficiency (187.87%) observed to wheat straw supplemented by soybean powder along with rice bran. It can be concluded as, the maximum yield and biological efficiency was found by implementation of composts in which high fiber substrates and high protein supplements were combined.

Bandopadhyay (2013) reported that cultivation of oyster mushroom on the aquatic weed water hyacinth is an eco-friendly way of disposing the problematic weed. Water hyacinth (without root) taken into the account the low cost substrate in different combinations with paddy straw for production of *Pleurotus florida*, *Pleurotus citrinopileatus* and *Pleurotus pulmonarius* to estimate the efficiency of the aquatic weed on the biological yield and nutritional composition of the mushrooms. Water hyacinth and rice straw in combination with equal ratio enhanced significant increase in biological yield in all the three *Pleurotus* species in the first flush at ambient temperatures. The maximum average yield was obtained from *Pleurotus citrinopileatus*. Mushrooms grown on paddy straw alone, water hyacinth alone, and on combination with paddy straw along with water hyacinth in equal ratio (1:1) were analyzed for their moisture, total protein content, total carbohydrate, starch, cholesterol, ascorbic acid, niacin, reducing sugar, crude fiber, ash, K⁺, EC, and pH. All the mushroom species recorded on dry weight basis as 16-25% protein, 19-28% carbohydrate with no detectable amount of starch and cholesterol, 0.012-0.013% ascorbic acid, 0.001-0.002% niacin, 9% crude fiber and 2.8-5.8% potassium. No significant differences were obtained due to supplementation of rice straw with water hyacinth except the pH and EC.

Sharma (2013) carried out research on Oyster mushroom (*Pleurotus ostreatus*) effects of various substrates on mycelial growth, colonization time, primordial appearance time, mushroom yield, biological efficiency (BE), size of the mushroom and chemical composition were analyzed. Among all aspects, rice straw (control) was found as a best substrate with yield (381.85 gm) and BE (95.46%) followed by rice plus wheat straw, rice straw plus paper waste for the production of mushroom.

Yadav and Singh (2013) conducted an experiment on Pink Oyster Mushroom (*Pleurotus eous*) revealed that paddy straw gave higher yield and biological efficiency (330 g, 66%), mustard stem (310 g, 62%), and pea straw (315 g, 63%) were similar to wheat straw alone. The mushroom growth indirectly depends upon the amount of available nutrients present in the substrates and their availability to fungus.

Mamiro and Mamiro (2012) conducted a research trial on oyster mushroom species *Pleurotus ostreatus* were grown on paddy straw as the basal substrate. In first

crop, rice straw was thoroughly mixed at spawning with different percentage level as 0%, 25%, 50%, 75% and 100% of banana leaves or *Leucaena leucocephala* or maize bran or maize cobs. In second crop, paddy straw was combined at spawning with different percentage level as 0%, 1%, 2%, 3%, 4% and 5% of sunflower or cotton seed cake. It was observed that the mushroom yield and biological efficiency (BE) were higher on a (50:50) combination of paddy straw and banana leaves as 1,040.0 g and 98.5% respectively. Paddy straw complemented with 2% sunflower seed hulls found to be yield in 1,087.5 g and biological efficiency in 103.3% gave while, yield and biological efficiency to paddy straw complemented with 2% cotton seed hulls recorded to be yield 1,073.8 g and biological efficiency in 101.8% , and were significantly higher than other supplement combinations. Similarly, mushroom yield on banana leaves were recorded as 786.5 g, paddy straw were 582.5 g, *Leucaena leucocephala* were 534.5 g, maize cobs were 468.5 g, rice bran were 406.0 g and maize bran were 305.3 g.

Khare *et al.* (2015) investigated on a hybrid of *Pleurotus ostreatus* x *Pleurotus florida* (Po x Pf), was grown in a technological mushroom laboratory house at the Botswana College of Agriculture, Sebele. The substrates was cultivated on maize cobs, two grass species (*Cenchrus ciliaris* and *Eragrostis pallens*) and water reed (*Phragmites* sp.) complemented with 20% each of wheat bran, gram flour and cowpea pods. The maximum yield of the mushroom was observed with 84.9% biological efficiencies from pasture grass (*Cenchrus ciliaris*) complemented with cowpea pods, while 82.50 % was observed in substrate complemented with wheat bran and gram flour. The wheat bran, gram flour and cowpea pods when complemented to the substrates enhanced the final total yield of the mushroom by 8% to 20%. Maize cobs, *Eragrostis pallens* and *Phragmites* sp. found to be performed not at par even when complemented, in parameters of incubation period, days from spawning to the fruiting up to third flush and yield of the mushroom. Three yields, experimental yield, expected yield (80% of experimental yield) and pessimistic yield (60% of experimental yield) were taken into account in evaluation of cost : benefit analysis. The experimental yield was recorded on 500 Kg of dried pasture grass as a substrate. The highest profit was found to be 208% was recorded when experimental yield was considered, and a profit of 146% and 85% can be achieved even when experimental yield were taken into account as 80% and 60% of the, respectively. On the basis of

data, it can be concluded as oyster mushroom cultivation is a potential income generating enterprise which can be adopted by marginal and unemployed youth in Botswana.

Hasan *et al.* (2015) found that the efficacy of supplementing different percentage levels of wheat bran with sugarcane bagasse on the cultivation of pink oyster mushroom (*Pleurotus djamor*) in a complete randomized design with three replications, three spawn packets in each replication and six treatments. The sugarcane bagasse was combinations at spawning at different percentage levels with 0%, 10%, 20%, 30%, 40% and 50% of wheat bran. Data indicated that positive correlation between number of days from stimulation to primordia initiation and harvest, sugarcane bagasse complemented with 30% wheat bran took maximum time (5.5 days) for primordia and (5 days) to harvest, whereas 20% wheat bran found to be shorter time (6.8 days) to full colonization. 10% complement recorded maximum in average number of primordia per packet (176.3), fruiting body per packet (77.6) and weight per fruiting body (5.3 g). The growth of pileus and stipe were significantly (stipe length, pileus thickness) and biological yield, economic yield, dry yield, biological efficiency and cost : benefit ratio were recorded maximum with 10% wheat bran complement. The highest moisture content was evaluated on 50%, dry matter, ash on 20% and protein content, crude fiber on 30%. 50% complement was taken into account for the maximum amount of nitrogen, iron and phosphorus, while the quantity of calcium, magnesium and zinc were maximum on 20%, Potassium on 40% and sulfur on 30% substrates. although, 10% wheat bran combinations with sugarcane bagasse found to be a alternative option to produce pink oyster mushroom due to economical effectiveness.

Nadir *et al.* (2016) reported on Oyster Mushroom (*Pleurotus florida*) which wheat stalk alone and in combination with wheat bran, gypsum and soil. The highest rate of spawn run (21.50 day) discovered from control E and the lowest (14.75 days) was found in treatment C. The longest period of days taken for initiation of primordia from treatment E 100% wheat was (33.50 days), and the shortest (15.75 days) was found in treatments C and D. The highest yield (333.2±2 g) was obtained from treatment A 88% wheat, which was not significantly higher than the other treatments. The total yield was collected from three flushes of harvested mushroom. The lowest

yield (295.9 ± 2 g) was observed from treatment D 52% wheat. Ngetich *et al.* (2013) studied to examine the growth and yield performance on Oyster mushroom (*Pleurotus ostreatus*) using different substrates *viz.*, elephant grass, cotton seed husks, sugarcane bagasse, corn cobs, beans straw, mixture of bagasse and maize cobs (1:1) and bagasse and beans straw (1:1) to evaluate the substrate. The substrates were treated with the spawn of edible mushrooms before incubation. Data showed that number of days for complete mycelia growth, stem height (cm), stem circumference (cm), cap diameter (cm) at harvesting, days to harvesting in the cropping chamber and total edible yield (kg). The substrates significantly positively correlated with growth and yield of mushroom differently. Cotton seed husks not only indicated a maximum yield of 118 kg/m² but in greatly stem circumference (49.0%), mushroom height 69% and cap diameter (16.6%) compared to the control (elephant grass).

Hoa *et al.* (2015) conducted an experiment in two oyster mushroom species namely, *Pleurotus ostreatus* and *Pleurotus cystidiosus* showed that protein content on dry weight basis varied between 19.52-29.70% and 15.68-24.54%, respectively. The highest protein of mushrooms *Pleurotus ostreatus* and *Pleurotus cystidiosus* were recorded from fruiting bodies grown on 100% Corn cob. The highest mushroom weight of mushroom *Pleurotus ostreatus* (45.10 g/bunch) was obtained from substrate 100% Corn cob, followed by 43.14, 42.95 g/bunch obtained from substrate 50% Sawdust + 50% Corn cob and 100% Sugarcane bagasses, respectively. Fruiting bodies of mushroom showed positive correlation between high protein, carbohydrate, fiber and low in fat content as excellent foods.

Khatuna *et al.* (2015) studies on species of oyster mushrooms (*Pleurotus* spp.) that grown round the year in the plains of India for their nutritional composition and their antioxidant characteristics. Maximum protein content was recorded in *Pleurotus florida* (22–25% on dry weight basis) followed by *Pleurotus citrinopileatus* (20–22% on dry weight basis) and *Pleurotus pulmonarius* (15–18% on dry weight basis). Cholesterol content was observed in the variation of 0.6–0.8% on dry weight basis, processing them low-cholesterol and proteinaceous food. The antioxidant characteristics of the three species were found to be enzymatical and non-enzymatical. Reducing power, chelating activity on iron compound (Fe^{2+}) and available total phenol contents were observed maximum in *Pleurotus florida* followed in *Pleurotus*

pulmonarius and *Pleurotus citrinopileatus*. As per availability of antioxidative enzymes, *Pleurotus florida* had the maximum peroxidase and superoxidedismutase activity also, highest catalase activity was recorded in *Pleurotus pulmonarius*. *Pleurotus florida* found to be maximum antioxidative activity in comparison to *Pleurotus pulmonarius* and *Pleurotus citrinopileatus* thereby significance of its nutraceutical values along with nutritional qualities.

Girmay *et al.* (2016) studies on different substrates of *Pleurotus ostreatus* and results revealed that mycelium growth occurs in cotton seed and paper waste (14 days) than on wheat straw (15.67 days) and sawdust (19.67 days). The time period of pin-head formation reported as varied from 17 to 33 days after spawn seeding. The time period of pin-head formation reported in cotton seed, sawdust and wheat straw as 17 days, 29 days and 32.66 days respectively. Besides, the observation recorded on the density of mycelia revealed that cotton seed and paper waste have higher mycelia density as compared to that of wheat straw and sawdust. Therefore, It can be concluded that cotton seed as the preferred substrate for oyster mushroom cultivation and paper waste can be used as alternative substrate for the growth performance and yield, this could also serve as a solution for utilization of the huge paper wastes available.

Iqbal *et. al.* (2016) reported on growth, production and quality of oyster mushroom (*Pleurotus florida*) and to check the effect of different substrates in mushroom laboratory wheat straw, rice straw, sugarcane bagasse, maize straw and sorghum straw. The mushroom culture on Malt Extract Agar medium and preparation of mushroom spawn on wheat grains. As compared to other substrates mushroom took less time as 20 days. The appearance of pinhead and their maturity also took less time i.e. 29 days and 30 days, respectively on wheat straw. Maximum yield and biological efficiencies recorded in wheat straw as 1360 gram and 136% respectively. The maximum moisture content (93.44%) and ash (1.006%) was reported in oyster mushroom obtained from sorghum straw. Percent protein content (8.75 g), crude fat (10%) and crude fiber (3.5%) were maximum in oyster mushroom grown on sugarcane bagasse, maize straw and wheat straw respectively.

Jayachandran *et al.* (2016) investigated the effects of sorghum, paddy grain and wheat grain for production of spawn for *Pleurotus florida* at laboratory. Findings suggested that rice grain took 10 days for spawn, pinhead formation, stalk length, pileus diameter, pileus thickness, yield (383.81 ± 0.24) and biological efficiency (76.76%). Similarly, Sorghum took 12 days for yield (303.63 ± 0.01) and biological efficiency (60.72%) and wheat grain took 13 days for yield (283.21 ± 0.01) and biological efficiency (56.64%) for spawn development of *Pleurotus florida*.

Mandaviya *et al.* (2016) carried out an experiment on production of pink oyster mushroom. Substrates were evaluated as wheat straw, paddy straw, sorghum straw, maize straw, sugarcane bagasse and banana pseudo stem. The results showed that the highest number of fruiting body was observed in wheat straw (31.00) followed by paddy straw (27.00). The length of stipe of mushroom on different substrates varied from 2.34 to 3.08 cm. The maximum length of stipe was recorded in wheat straw (3.08 cm) whereas the minimum was recorded in sugarcane bagasse (2.34 cm). Cap diameter was recorded in wheat straw (9.90 cm) which was at par with paddy straw (9.70 cm). The maximum stipe thickness was recorded in sugarcane bagasse (6.53 cm) which was at par with wheat straw (6.21 cm). The maximum yield obtained from wheat straw (213.20 g/kg) was best substrate.

Jonathan *et al.* (2016) investigated on oyster mushroom *Pleurotus ostreatus* (Jacq. Fr.) Kumm. carried out experiment on different agricultural substrates *viz.*, Paddy straw, *Gossypium hirsutum* wastes and *Milicia excelsa* sawdust were used. Different agricultural substrates were mixed evenly with Paddy straw additive in order to promote mycelial growth of this edible mushroom. Maximum moisture content, crude protein content, fat contents and fiber contents recorded in 93.43%, 28.02%, 8.72% and 17.42% with cotton waste substrate supplemented with 20% rice bran respectively. The data revealed that mushroom was deficient in vitamin A, but contained adequate amount of vitamin B₁, B₂, B₃, B₆ and D. Maximum biological efficiency (B.E) was observed 93.6% while the minimum in 74.0%. Cotton waste positively correlated to be the good substrate that enhanced the growth of this fungus

Salama *et al.* (2016) concluded that the effect of residues of agriculture wastes by using polyethylene bag wall technique on *Pleurotus colomninus* L. strain 99 yield

and their quality during two successive seasons of 2013-2014 and 2014-2015. The results evaluated that different substrates viz. clover straw, wheat straw, sawdust, corn cob, soybean straw and rice straw showed significant difference in parameters of fruiting bodies, yield, biological efficiency, nutritional composition and mineral contents. In both seasons, it has been observed that the highest number counted fruit per bag from rice 14 and 14.33 fruit per bag and wheat straw 14 and 13.33 fruit per bag respectively. However, the increased yield weight found to be 288.10 g fruit per bag and 317.33g fruit per bag and biological efficiency 82.26% and 90.63% soybean straw in both seasons respectively. The six substrates as paddy straw exhibited the suitable cultivation media and their significant difference on physical parameters viz. stalk length, stalk diameter and cap diameter. Highest content of nitrogen estimated were 2.50 and 2.57g per 100g, phosphorus 2.50 and 2.57g per 100g and potassium 2.54 and 2.63g per 100g from clover straw in both seasons respectively. While the increased contents of protein 7.41 and 7.24 g per 100g, carbohydrates 31.40 and 33.34 g per 100g and energy 158.17 and 165.91 obtained from soybean straw in both season respectively. Wheat straw substrate showed that the amount of fat 0.42 and 0.42 g per 100g and fiber content 5.42 and 5.60 g per 100g in both season respectively, on the other side corn cob substrate gave the highest ash content 9.11 and 9.30 g per 100g in both seasons respectively. The raw and spent substrates were evaluated for their nutritional value composition.

Mijain (2017) evaluated Oyster Mushroom (*Pleurotus sajor-caju*) in different substrates, paddy straw recorded highest yield (803.00 g) followed by banana leaves (724.00 g), wheat straw (601.00 g), sugarcane bagasse (560.00 g), newspapers (455.00 g) and highest biological efficiency was recorded in paddy straw (80.30%) followed by banana leaves (72.40%).

Pathania (2017) found that the best yield of Oyster Mushroom (*Pleurotus ostreatus*) was observed when 0.50 kg of apple pomace mixed with 1.50 kg of apple pomace maximum fruiting body i.e. 28 were observed with approximate weight of 110gm with highest biological efficiency of 54.23% which is higher than the yield obtained from wheat straw recommending it blending with wheat straw. There was a significant increase in yield of mushroom in apple pomace + straw as compared to

control i.e. wheat straw. The NPK found to be 3%, 0.18% and 2.6% respectively and 3.20% of fat content.

Singh *et al.*(2017) carried out an experiment on *Pleurotus djamor* and found maximum yield (440.00g/kg of dry substrate with 44.00% B.E.), minimum days for spawn run (23.00 days), minimum days for first harvesting (30.00 days), maximum days for cropping period (61.00 days), highest pileus length and width (9.0 cm and 9.67cm) were observed at wheat straw, while highest number of fruiting body (17.00) and highest number of lob (46.00) was observed in wheat straw + paddy straw.

Zaman *et al.* (2017) tried find out to the effects in nutritional composition of *Pleurotus florida* with combination of wheat straw and paddy straw in control and additive environment of wheat bran (10%) and lime (4%). The observation were recorded as the maximum moisture content (92.35%), Protein (25.37%), Carbohydrate (32.57%) in Paddy straw + wheat bran15%. The highest amount of Ash (8.5%) and Crude fiber (9.32%) was observed on Wheat straw + Wheat bran15% + lime 4%. The maximum Crude fat (2.86%) was recorded on wheat straw. The maximum amount of calcium (2.6mg/100g), magnesium (23mg/100g) and potassium (335mg/100g) was observed on Paddy straw + wheat bran15%. The maximum amount of iron (3.35mg/100g) was obtained from paddy straw and zinc (3.7mg/100g) on wheat straw + wheat bran15% + lime 4%. The maximum amount of sodium (35mg /100g) was observed on wheat straw. The investigation revealed that Paddy straw + wheat bran15% was found to the best substrate combination for cultivation.

Prasad *et al.* (2018) found that protein content was obtained from fruit bodies harvested from the substrate combination 50% Wheat straw + 50% *Panicum maximum* giving (28.56%), a significant increase over the control. It was observed that the pH of almost all the substrates was in the range of 6.02 to 6.83 which was optimum for mycelial growth and subsequent fruiting body development except for 100% *Panicum virgatum* where the pH was 5.98. Singh *et. al.* (2017) studies on cultivation of Oyster mushroom (*Pleurotus djamor*) on different substrates as Wheat straw, Paddy straw, and Chickpea straw were used alone and also in a combination of each other with 1:1 ratio (w/w), results showed that the maximum yield (440.00g/kg of dry substrate with 44.00% B.E.), minimum days for spawn run (23.00 days),

minimum days for first harvesting (30.00 days), maximum days for cropping period (61.00 days), highest pileus length and width (9.0 cm and 9.67cm) were observed in wheat straw while highest number of fruiting body (17.00) and highest number of lob (46.00) were observed in wheat straw along combination with paddy straw.

Shalahuddin *et al.* (2018) conducted an experiment on the effect of different chemical nutrients (NPK, 2:1:1) on the production and proximate composition of oyster mushroom (*Pleurotus ostreatus*) revealed that the highest economic yield and cost : benefit ratio has been recorded as 267.38 g and 5.17 in treatment, (4 g NPK in 10 kg straw). The highest moisture content was found in only 10 kg straw 88.57% performed significantly better on growth and yield of oyster mushroom.

Patar (2018) conducted an experiment *Pleurotus florida* and *Pleurotus sajor-caju*. Yield potential of *Pleurotus florida* (1363 g per kg of dry substrate) was also found to be better than *Pleurotus sajor-caju* (940 g per kg of dry substrate). The results further obtained in *Pleurotus florida* showed average stalk length (3.5 cm), average stalk diameter (1.2 cm), average cap diameter (7.7 cm), maximum weight of fruiting body (40 g), minimum weight of fruiting body (34.3 g) with total number of fruit bodies recorded to be 48. Whereas, the results of *Pleurotus sajor-caju* showed average stalk length (2.8 cm), average stalk diameter (1.1 cm), average cap diameter (6 cm) and maximum weight of fruiting body (34 g).

Situala *et al.* (2018) found out that the growth and yield performance of oyster mushroom (*Pleurotus ostreatus*) in Completely Randomized Design (CRD) used substrates, the time for colonization and fruit initiation was found to be shorter in case of the paddy straw *i.e.* 18.25 days and 21.75 days respectively. However, the length of stalk was highest in sugarcane bagasses + paddy straw (1:1) *i.e.* 6.10 cm, but the diameter of stalk and pileus were highest in paddy straw *i.e.* 0.80 cm and 7.90 cm respectively. Similarly, the biological efficiency was found to be highest in case of the paddy straw (96.29%) followed by maize cob+paddy straw (1:1), sugarcane bagasses + paddy straw (1:1) and sawdust + paddy straw (1:1) respectively.

Gorai and Sharma (2018) observed that the spawn run was most quick with (12.78 days) and pinning initiation (10.28 days) was most quick with sugarcane bagasse as substrate. While, the biological efficiency was observed to be highest with

paddy straw as substrate ranging from 93.2-84.6% followed by the mixture of Paddy straw and sugarcane bagasse (1:1) ranging from 80.4- 75.6 % and the least was exhibited by sole use of sugarcane bagasse from 67.6% - 41.6%.

Kumar *et al.* (2019) reported that the best performance was observed in unchopped paddy straw with minimum spawn run days (11.33), sporophore maturity days (17.33), sporophore yield (471.83g) and biological efficiency (94.36) compared to chopped paddy straw.

Prameela and Devi (2019) performed experiment on milky mushroom and result revealed that paddy straw substrate was best and recorded an average yield of 1.0 to 1.5 kg per bed as compared to the other substrates. After paddy straw, the yield of milky mushrooms on coconut coir pith (806 g/ kg substrate) and oil palm waste (830 g/ kg substrate) was found on par with each other and yielded more compared to other substrates.

Raman *et al.* (2020) revealed that *Pleurotus djamor* var. *roseus* is an edible mushroom isolated from the wild and cultivated on paddy straw substrates. The present study was carried out to compare the nutritional composition and antioxidant properties of *Pleurotus djamor* var. *roseus* at different growth stages (primordia, basidiomata and mycelia). The protein content was in the varied from 31.48 to 35.50 g per 100g dry weight basis. The crude fiber content varied from 8.0 to 14.60 g whereas total carbohydrates varied from 44.75 to 48.90 g. Sodium, magnesium, and calcium reached the maximum levels in basidiomata, and selenium was detected in basidiomata and mycelia (0.47 - 0.22 mg/Kg). The amino acid profile revealed that all essential, non essential amino acids and glycine observed highest levels in basidiomata and 15.98 ± 0.01 g/100g. The fatty acid profile revealed the presence of saturated and unsaturated fatty acids, the unsaturated fatty acid content was highest in all of the samples, varies from 76 - 40.41%. The total phenol and flavonoid contents as well as the scavenging (DPPH), ferric thiocyanate (FTC) and thiobarbituric acid (TBA) activities in the context of methanol and water extracts from primordia, basidiomata, and mycelium were determined. Among them, basidiomata and mycelial methanol extracts exhibited significant antioxidant activity revealed that *Pleurotus. djamor* var. *roseus* can be used as a functional food for daily consumption.

Pal *et al.* (2020) investigated that the effectiveness of different substrates *viz.*, finger millet straw (*Eleusine coracana*), paddy straw (*Oryza sativa*) and their combination (50% finger millet straw (*Eleusine coracana*) + 50% paddy straw (*Oryza sativa*) at Tawang, Arunachal Pradesh, India in three treatments replicated five times were put under completely randomized design. The growth characteristics in various parameters as spawn running days, appearance of pin head, fruiting bodies maturity, flushing days intervals, total cropping period, total yield (g) and biological efficiency (B.E %) of *Pleurotus florida* cultivated. The minimum average days interval between flushes observed on finger millet straw (*Eleusine coracana*) was 7.8 days followed by (50% finger millet straw (*Eleusine coracana*) + 50% paddy straw (*Oryza sativa*) was 12.1 days for *Pleurotus florida*. The total highest yield and biological efficiency were indicated on finger millet straw (*Eleusine coracana*) was 1155.40g and 92.43% respectively. On the basis of data, it can be concluded that finger millet straw (*Eleusine coracana*) can be taken as substrate for good yield and fetching good market price.

2.2 Effect of different substrate in benefit : cost ratio

Celik and Peker (2009) studied on cost benefits ratio and SWOT analysis of mushroom production in developing countries as diversification of rural income in Konya, Turkey. Data revealed that the using survey method by application of 33 questionnaire. In research area, the average production area was calculated as 1135.1 m². The average yearly output of the total business activities in periodic output, compost output was recorded as 45.4 kg/m², 11.6 kg/ m² and 256.6 kg/ton respectively. The cost of one kilogram mushroom as an average of business was US dollar 1.36 that its average sales price was US dollar 1.54. On the basis of above observation, it can be concluded as the providing equal opportunity to mushroom production sector could strengthens rural economy to promote its vibrancy and development, enhancig diversifying business activities and employment opportunities in the rural areas.

Singh *et al.* (2010) examined that the cost, returns and break-even point of mushroom production on different categories of farms in the districts of Sonapat and Gurgaon in Haryana in the period 2003-04. On the basis of simple tabular data analysis, benefit : cost analysis, break-even level, price spread and marketing

efficiency results showed that (i) the fixed capital investment is more than double in large and medium farms as compared to the small farms, (ii) the use of compost has a positive relationship with the farm size, (iii) there exists a positive relationship between mushroom production and farm size, (iv) Large farmers have lowest cost of mushroom cultivation as compared to small and medium farms due to efficient utilization of fixed available farm resources, (v) the producer share in consumer in terms of rupee is maximum in channel-IV as compared to channels II, III and I, respectively. The channel-I is the minimum efficient due to the existence of middlemen. The study has suggested that (a) mushroom cultivation being capital-intensive, needs financial assistance through government and non government institutional agencies at low interest rate would be the desirable results, (b) mushroom being a low self life and prone to high temperature, marketing infrastructures efficiency such as cold storage availability are of great importance. Similarly, suitable arrangements are required by the canning and processing units for the management of surplus mushroom.

Singh *et al.* (2013) conducted a research trial on oyster mushroom species *Pleurotus djmore* and *Pleurotus sajor-caju* were grown on different substrates in Uttarkashi district, Uttarakhand. Substrates used in this experiment as wheat straw, hybrid Napier, maize cob shell, finger millet waste, blackgram waste, lentil kernel, and chopped mustard straw. The results revealed that the biological efficiency (BE) recorded from each substrate was more than 90%. The maximum yields in wheat straw of *Pleurotus djmore* and *Pleurotus sajor-caju* were recorded as 1180 g/500 g dry substrate, biological efficiency 118% and 1020 g/500g dry substrate, biological efficiency 102% respectively. The average cost : benefit ratio recorded as 1:4.6, 1:3.7 and 1:2.2 at 100%, 80% and 60% of experimental yields.

Chitra *et al.* (2018) carried out research in the Mushroom Production Unit, Department of Plant Protection, Anbil Dharmalingam Agricultural College & Research Institute, Tiruchirappalli from January 2018 to April 2018. It showed that the total expenditure in mushroom cultivation was Rs.5760/-. Main input of mushroom production cost incurred in quality spawn. The data revealed that average cost of spawn per bags was observed about Rs.30/- and cost of production per kilogram of mushroom was Rs. 60.63/-. It has been recorded as the gross return and

net return Rs. 20000/- and Rs.14240/- respectively. The return per kilogram found to be Rs. 149.89/-. It can be concluded as the mushroom cultivation can help in improving the livelihoods through economic, nutritional and medicinal properties. But, mushrooms cultivation in a commercial way is underway. However, visualizing mushroom cultivation as a sustainable tool is a new challenge. Keeping this in mind, the students were trained and motivated to grow oyster mushroom

Mayanja (2018) carried out the research in mushroom production, estimating profits, conducting a benefit cost ratio (BCR) and break even point (BEP) in Kampala Metropolitan area, Uganda, during the period of 2016. 52 respondents were interviewed face to face through use of questionnaires and data showed that the average net profit of in a period of three months, Benefit Cost Ratio of and Break Even Point were recorded as 2,385.31 US dollars per farm, 4.08 and 106.41 Kg, respectively.

Akter *et al.* (2019) worked to check the effects of different spawn seed on different varieties showed the running rate of oyster mushroom. The maximum was recorded in maize based spawn seed on the *Pleurotus florida* as biological yield, economic yield, dry yield, biological efficiency (BE) and benefit cost ratio (BCR) 264.9g, 259.3g, 25.17g, 86.90 and 9.11% respectively. It can be concluded that the positive correlation between yield and market opportunities.

Shahi *et al.* (2018) studied on the impact of vocational training programme on mushroom production for Entrepreneurship Development at Krishi Vigyan Kendra, Hajipur and Muzaffarpur districts of Bihar during the year 2007 to 2018 and total 400 respondents was participated in training and demonstration on mushroom production technique. Data revealed that the exposure to training had enhanced farmers knowledge, farm women and youths regarding techniques mushroom production by 80.75% and observed that it was possible due to educational background, keen interest of participants and methods followed for technology transfer to the trainees and self-employment and set up their own units.

Mutema *et al.* (2019) investigated that profitability of oyster mushroom production by small scale farmers in urban and peri-urban areas with net attention on trends in production, capital expenditure and revenue collection in the year of 2014–

2017. To estimate various parameters to check profitability viz., net present value (NPV), Discount rate and benefit : cost ratio (BCR) and Internal rate of return (IRR) were used. The average values of net present value, Discount rate and benefit cost Ratio and Internal rate of return were observed as 13036.46, 15.75 and 141.42%, respectively. These data indicated that mushroom production has been very profitable in the year of 2014–2017. Furthermore, trends of data showed that production decreased in the year of 2014–2015 before rising exponentially from 2015–17. It can be concluded that the lack of capital support, marketing inefficiencies, lack of adequate space for production, training, availability of quality of spawns and substrates, temperature regulation, mushroom diseases, people's negative attitude and water shortages are the major challenges in mushroom production. But due to government and nongovernmental organisations, contract farming, formation of mushroom growers association and provision of post services to producers problem would be resolved in time bound manner.

Sharma *et al.* (2019) carried out the research on oyster mushroom (*Pleurotus spp*) to investigate the method of preparation and economic opportunities in Mandi district of Himachal Pradesh. The overall fixed and variable cost of production per 100 bags for oyster mushroom was recorded as 69.98 and 30.02 per cent respectively. The overall gross returns per 100 bags on the basis were found to be Rs. 16,800 and benefit : cost ratio was observed as 1.83:1. Break-even output for oyster mushroom was recorded as 139 kg and break-even point was noted as 66. Thus, It can be concluded that the farmers should keep at least 66 bags of oyster mushroom to meet the cost of production.

Dubey *et al.* (2019) conducted research trial at Mushroom house, Institute of Agriculture and Animal Science (IAAS), Paklihawa, Bhairahawa during January to March 2015 in single factor taken account in Completely Randomized Design (CRD) replicated for 4 times. The findings of the research to put forward to determine the efficacy of different substrates on the performance of Oyster Mushroom (*Pleurotus sajor- caju*) with treatments as paddy straw, wheat straw, banana leaves and sugarcane bagasse each bag weight of 4.5 kg. The maximum yield was recorded as 1515 gm with maximum stipe length (4.86 cm) and diameter of cap (5.14 cm) from the rice straw followed by other substrates. The duration of colonization was 19 days

minimum for wheat straw and banana leaves, while duration of fruiting body was 20.5 days was minimum in wheat straw. The paddy straw in comparison to the other agricultural residues with cost : benefit ratio of 3.49.

Sachan and Kumar (2020) reported that the various costs, returns and the breakeven point analysis under various categories of farms in Uttar Pradesh period of 2016-17. It taken into the account the evaluations of marketing systems, costs, margins and marketing demands. The study found that (1) The fixed cost and its investment in mushroom production is two times for medium and large farms when its compared with small farms due to lack of loan availability to farmers and observed a cooperative association with size of farm. (2) The size of the farm is directly proportional to cost of compost and spawn. (3) Data showed a positive correlation between mushroom production, farm size and income. (4) Channel IV found to be most common channel as highest to produce passes through this channel, but Channel I has the highest share of producer in consumer price which made the channel I viable for farmers as well as consumers. The investigation revealed that the mushroom cultivation needs more capital investment, hence low interest capital needs to be provided and its being perishable crop, infrastructure should be improved to enhanced the self-life of mushroom production.

Rawat *et al.* (2020) conducted research trial on the mushroom production unit of Department of Rural Technology, Chauras Campus, HNBGU, Srinagar, Garhwal during the period of 2017-19. The results revealed that the cost of production, returns and break-even point analysis of mushroom production on different mushroom production unit for regular income generation and employment opportunities in rural areas. It has been observed that if mushroom price per kg decreases to Rs.136.20 given to actual cost of production is not less than 59.25 kg in oyster mushroom similarly, Rs.114.30 given to actual cost of production is not less than 441.11 kg in button mushroom in a growing period of cultivation. A total of four production periods annually installed in that area. Strengthening mushroom production farming could be necessary for sustaining the rural economy to improve their development activities, diversifying business and employment opportunities. As per data analysis, benefit : cost analysis and break-even concluded that mushroom entrepreneur in Srinagar, Garhwal valley may be encouraged through skill and proper planning.

Rahmawati and Marbudi (2021) conducted the research on oyster mushroom to check the cost, profit and feasibility of farming in highlands in Sleman and Temanggung Regency, Indonesia. A snowball method was taken into account to evaluate the respondents consisting of 32 oyster mushroom farmers and took descriptive method and t-test were employed to analyze the differences in the average cost, income, profit, and benefit : cost of farming. The data showed that the profit and feasibility of oyster mushroom farming in Temanggung were higher as compared to Sleman reagency as far as the cost of farming in both regencies was relatively the same.

Chapter-III

Materials and Methods

The present investigation entitled “**Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions**”. The experiment was carried out in the research laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Rae Bareilly Road, Lucknow, 226 025 (U.P.), India from October 2019 to December 2019 and October 2020 to December 2020. The information of methodology adopted in this experiment has been presented below:

3.1 Location and site of experiment

The present investigation was carried out research laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Rae Bareilly Road, Lucknow, 226 025 (U.P.) from October 2019 to December 2019 and October 2020 to December 2020. The elevation of Lucknow city is situated at of 123 meter above mean sea level in the subtropical tracts of 26⁰-56⁰ North latitude of Central Uttar Pradesh.

3.2 Experimental materials

Mother culture of oyster mushroom was collected from Buddha Mushroom Spawn Lab, Rajgir, Bihar. Wheat straw and Paddy Straw as a substrates was collected from peri-urban areas of Lucknow.

3.3 Climatic requirement

3.3.1. Temperature

Temperature requirement of Oyster mushroom species *Pleurotus florida* ranged between 20-30 °C under normal conditions. There was always in mind to keep temperature shock during the cultivation process. The Pileus or cap colour depend on temperature and showed colour light brown to pale yellowish.

3.3.2. Relative humidity

During fruiting, there was need to maintain the relative humidity of 70-80% in *Pleurotus florida*. However, depending upon relative humidity and seasonal

3.3.3. Weekly meteorological data for the year 2019 and 2020

Period		Mean temperature (⁰ C)				Relative Humidity (%)		Wind Velocity (Km/hr)		Total Rainfall (mm)	
Month	Date	Max.		Min.							
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Oct	(1-7)	31.0	35.0	19.2	21.8	79.0	72.0	1.3	1.4	0.0	0.0
Oct	(8-14)	33.1	35.2	17.1	19.9	75.0	69.5	1.3	0.9	0.0	0.0
Oct	(15-21)	32.0	34.5	16.8	19.2	76.5	66.5	0.6	1.0	0.0	0.0
Oct	(22-28)	30.0	33.3	11.6	14.9	73.2	61.0	1.3	1.4	0.0	0.0
Oct-Nov	(29-4)	30.0	31.6	15.2	12.0	75.0	57.5	1.2	1.5	0.0	0.0
Nov	(5-11)	29.5	30.1	14.9	10.2	67.5	64.0	1.8	0.7	0.0	0.0
Nov	(12-18)	29.4	29.1	13.0	13.7	64.0	73.0	1.9	1.5	0.0	0.0
Nov	(19-25)	27.7	25.8	11.9	9.8	69.0	63.5	2.1	2.0	0.0	0.0
Nov	(26-2)	26.5	26.6	12.5	8.2	76.0	66.5	1.4	1.2	0.0	0.0
Nov-Dec	(3-9)	24.9	26.6	8.2	9.3	70.0	72.0	1.2	0.7	0.0	0.0
Dec	(10-16)	22.2	23.6	10.4	11.8	79.5	76.4	1.5	1.9	0.0	0.0
Dec	(17-23)	17.9	20.9	7.9	4.2	80.0	63.3	1.2	2.5	0.0	0.0
Dec	(24-30)	15.2	23.1	5.7	4.2	79.0	65.0	2.1	1.2	0.0	0.0

variations, water spraying was done in the mushroom lab as per requirement. As per normal standard procedure, during hot and dry weather conditions it required 2-3 spray daily. Whereas, hot and humid conditions needs one light spray were be sufficient.

The number and amount of water spray was judged by touching the substrate surface. The fine nozzle allowed mist or fog to spray uniformly. Ventilators and exhausts fans were operated to remove excess moisture from the surface. Bleaching powder at the rate of 0.05% was sprayed at 8-10 days interval to avoid offensive smell due to the saprophytic bacteria which grown at wet surface.

3.3.4. Oxygen and carbon dioxide requirement

The carbon dioxide concentration for oyster mushroom *Pleurotus florida* mycelium spawning rate varied from 600 ppm to 20,000 ppm for optimum growth and development. Long stipe and small pileus were observed if CO₂ concentration uncontrolled.

3.3.5. Light

Generally, mushrooms do not need sunlight directly for the synthesis of food and dead organic plant material. Diffused light needed for fruit body formation. For example, primordia development 200 lux intensity required for 8-12 hour. Light and air is essential for growth and development of fruiting body.

3.3.6. Hydrogen ion concentration (pH)

The pH level in mycelia colonization found to be ranged 7.0 and 8.0. Water was not containing harmful salts or heavy metals. Rusted tubs used for substrate treatment or storing water must be kept away due to chances of microbial contamination.

3.4. Cultivation Practices / Cultural Practices

3.4.1. Substrate preparation

Paddy straw and wheat straw were collected, shade dried and subjected to chemical pasteurization by using 75ppm carbendazim and 500 ppm formalin for 12 hours. Then the substrate was shade dried and used for preparation of beds. After 12

hours of soaking period, excess of water was drained off. The wet substrate was taken up to a moisture content of 75-78%. The substrates were spread on a pre-sterilized polythene sheet and thoroughly spawned at 2% of the wet substrate.

However, yield of oyster mushroom largely depends on the available nutrition and nature of the substrate. The substrate was taken be fresh, dry, free from mould infestation and properly stored. Cellulose rich substrates like agro-waste give better yields as it helps in more enzyme production, which is correlated with higher yield.

3.4.2. Methods of substrate preparation

The mycelia growth took place on a simple water treated paddy straw and wheat straw but it contains toxic metabolites in the form of cellulolytic moulds which hampers its growth. There was standard procedure to kill the microorganism. The substrate can be prepared by collective effects of different techniques as chemical sterilization.

3.4.3. Chemical sterilization technique

Various species of *Trichoderma*, *Gliocladium*, *Penicillium*, *Aspergillus* and *Doratomyces* spp. are the common harmful microorganisms fungi on the paddy straw and wheat straw in the oyster mushroom production which causes reduction in the mycellial growth and yield loss. The process of chemical sterilization was standardized by adopting the methodology of Directorate of Mushroom Research, Solan, Himachal Pradesh (1987).

100 litres of water was taken into a rust proof drum specially in G.I. tub of 200 litres water holding capacity. Total 3 tub were taken for given amount of substrate. 12 kg of wheat straw was taken slowly steeped in water. In another plastic bucket, Carbendazim (Bavistin) 7.5 g and 125 ml formaldehyde (37-40%) was readily dissolved and slowly poured on the already soaked wheat straw. Straw is pressed deeply along with thoroughly mixing and covered with a polythene sheet. After 18 hours the straw was taken out and excess water drained.

3.4.4. Spawning of substrate

Freshly prepared grain spawn was found to be best for spawning about 20-30 days old. The spawning was done in a pre-fumigated room with 48 hour with 2%

formaldehyde. The spawn were thoroughly be mixed with at the rate of 2-3% of the wet weight of the substrate. Spawn bottle of 200 g is adequate for 5 kg of wet substrate. Spawn were mixed in different layers. Spawned substrates were filled in polythene bags size dimensions of 80cm length and 40 cm width having thickness of 125- 150 gauge. 15 to 25 small holes were made having diameter of 0.5- 1.0 cm on all sides to keeping in the mind that 2-5 holes in the bottom of the polythene bags for draining excess water. Polythene sheets of 200-300 gauge having thickness of 1.25 x 1.25 m² were spread on floor. Spawned substrates were filled and the polythene sheet was folded from all the four sides and compressed to make a compact rectangular block. The block was incubated as such and after mycelium growth polythene sheet was removed.

3.5. Crop management

The spawned bags or blocks were kept in incubation room for mycelial growth at ambient temperature. Some of the *Pleurotus florida* fruits appeared at low temperature around 15 °C, whereas other species fruits showed at the temperature between 20-30 °C. However, the incubation temperature was around 25 °C for most of the species.

3.5.1. Incubation

Spawn bags were taken in raised platform that was used in cropping room for mycelial colonization of the substrate. Temperature was maintained upto 30°C in the cropping room were reduced the growth and killed. During mycelial growth the bags were kept tight and no ventilation was provided. As precautionary measure chemicals was sprayed on the wall to avoid entry of flies. Water were sprayed to maintain the temperature and carbon dioxide levels.

3.5.2. Fruiting body induction

After the fully colonized, the substrate was taken to the thick mycelial mat ready for fruiting. Contaminated bags with mould infestation were removed, while bags with patchy mycelial growth were left for few more days to complete the spawn run. All the blocks were arranged on wooden platforms with a minimum distance of 15-20 cm between each bag in the tier.

3.6. Harvesting

Mushroom was harvested before the fruiting body showed any splitting on the edges. The yield of mushroom and their different quality parameters *viz.*, days required to first primordial initiation, number of fruit bodies and biological yield were recorded regularly.

Biological efficiency (BE) was determined by the following formula:

$$BE = (\text{wt. of fresh mushroom fruit bodies}) \times 100 / \text{wt. of dry substrate}$$

3.6.1. Observations were recorded:-

1. Diameter of stipe (cm)

The stipes was selected randomly under each treatment at maturity stage. The diameter was measured with the help digital vernier calliper in centimeter.

2. Length of stipe (cm)

The stipes was selected randomly under each treatment at maturity stage. Measurement of stipes length from base to lower base of pileus recorded in centimeter.

3. Diameter of pileus (cm)

The diameter of pileus was selected randomly under each treatment at maturity stage and measured the diameter with the help of vernier calliper in centimeter.

4. Diameter of fruiting body (cm)

Diameter of effective fruiting bodies was measured from cap to end point of stipe recorded in centimetre.

5. Primordial initiation (days)

Each bag was closely put under careful supervision and days of appearance of the primordial recorded in days.

6. Pinhead formation (days)

Mushroom initials developed after rhizomorph formed in the casing. The initials were small and showed outgrowth of rhizomorph.

7. Maturity time of sporophore

The number of days required for first harvest of the sporophores from the date of spawning of the bed was recorded as maturing time of sporophores.

8. Days required pinhead initiation to first harvest

Days required from appearance of pinhead to first harvest were recorded.

9. Days required pinhead initiation to second harvest

Days required from appearance of pinhead to second harvest were recorded.

10. Days required pinhead initiation to third harvest

Days required from appearance of pinhead to first harvest were recorded.

11. Number of sporophores

The total number of sporophores harvested from the polythene bags were calculated and recorded periodically.

12. Weight of sporophores per bed (g)

The sporophores were weighed after harvest and yield per bed recorded in gram periodically.

13. Number of pin heads

The total number of pinhead appeared from the polythene bags were calculated and recorded periodically.

14. Number of fruiting bodies

Number of well-developed effective fruiting body was recorded. Dry and pinheaded fruiting bodies were discarded but tiny fruiting bodies were included in counting.

15. Number of primordia

The total number of primordia appeared from the polyethylene bags were calculated and recorded periodically in each polythene bags.

16. Substrates spawn run (days)

Number of days taken for 100 percent colonization or mycelial growth cover on the substrate was recorded.

17. Yield first harvest per bed (g)

The weight of fruiting bodies of first picking was added and the total values were recorded.

18. Yield second harvest per bed (g)

The weight of fruiting bodies of second picking was added and the total values were recorded after 7-8 days of first harvest.

19. Yield third harvest per bed (g)

The weight of fruiting bodies of second picking was added and the total values were recorded after 14-16 days of first harvest.

20. Total yield (g)

The weights of fruiting bodies of all pickings were added and the total values were recorded.

21. Biological efficiency (%)

Biological efficiency of mushrooms were calculated by dividing weight of fresh mushroom yield (g) by weight of air dried substrate (g) and multiply by 100.

$$BE = (\text{wt. of fresh mushroom fruit bodies}) \times 100 / \text{wt. of dry substrate}$$

22. Moisture Content (%)

It was calculated to weight of available moisture after harvesting and moisture after drying divided by weight of fresh sample in percentage.

$$\text{Moisture content (\%)} = \frac{\text{Weight of fresh sample} - \text{weight of dry sample}}{\text{Weight of fresh sample}} \times 100$$

23. Dry Content (%)

A clean container (dish or beaker) was placed in an oven at 105 °C overnight. The container was allowed to cool in a desiccator and was weighted. The samples were kept into the container and the samples were weighted. The container was placed in the oven at 105 °C for 24 hour again. The container was allowed to cool in a desiccator and was weighted. Again, the container was placed in the oven at 105 °C for 2 hour. It was cooled in a desiccator and weighted again. Repeat drying, cooling and weighing was continued until the weight becomes constant. Then the percentage of dry matter content of the sample was evaluated. A given weight of oven dry sample divided by original weight of sample multiplied by 100 was calculated as dry content.

24. pH Content

Juice of oyster mushroom immerse in the standardized electrode tip into the solution and stir the sample gently by means of a rod to give a constant pH value.

Assay method was given by Rangana (1999).

25. Acidity Content (%)

Take 10 gm well juice, dilute to 250 ml with neutralised or recently boiled water. Titrate with 0.1 N NaOH using 0.3 ml phenolphthalein for each 100 ml of the solution to pink end point persisting for 30 seconds. Report acidity as ml 0.1 N NaOH per 100 gm or 100 ml as required.

$$\text{Acidity} = \text{Volume} \times 0.0064 \times 100 / \text{volume of the sample taken}$$

Assay method was given by Rangana (1999).

26. Total Soluble Solids (⁰Brix)

A total soluble solid was determined by digital hand refractometer according to AOAC (Association of official analytical chemists).

27. Ascorbic acids (%)

a. Preparation of 3% meta phosphoric acid:

3g pellets of HPO_3 dissolved in distilled water.

b. Preparation of standard ascorbic acid solutions

100 ml of ascorbic acid was weighed and made up to 100 ml with 3% HPO_3 . 1 ml of this solution diluted to 10 ml by adding 3% HPO_3 .

c. Preparation of dye solution:

52 mg of sodium salt of 2,6 - dichlorophenol indophenols was dissolved in 150 ml of distilled water containing 42 mg of sodium bicarbonate. After cooling, it was diluted with distilled water to 200 ml and stored in refrigerator and standardized.

d. Preparation of sample

10 g of juice sample was blended with 100 ml of 3% HPO_3 then filtered.

e. an aliquot (10 ml) of the sample was taken titrated against the standard dye with pink colour end point which persisted for 15 seconds.

Ascorbic acid = $\text{Titrate} \times \text{dye factor} \times \text{volume made up} / \text{Aliquot extract taken for extraction} \times \text{weight of sample taken for estimation}$.

Assay method was given by Rangana (1999).

28. Total Sugars (mg/100 gram)

For the estimation of total sugars, 20 ml of juice solution taken in a beaker and 5 ml concentrated HCl was added. Solution was boiled for 5 minutes for the hydrolysis of non reducing sugar into the reducing sugars. After cooling excess of acid was neutralized by sodium carbonate solution. The solution was transferred in a 100ml volumetric flask and volume was made a mark by distilled water. This solution was taken in burette and titrated with the Fehling solution A and Fehling solution B.

(1) Fehling A: Dissolve 69.28-g copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in distilled water. Dilute to 1000 ml. Filter and store in amber coloured bottle.

(2) Fehling B: Dissolve 346 g Rochelle salt (potassium sodium tartrate) and 100 g NaOH in distilled water. Dilute to 1000 ml filter and store in amber coloured bottle.

Total Sugars = 1.25/ Burette reading x 100

Assay method was given by Rangana (1999).

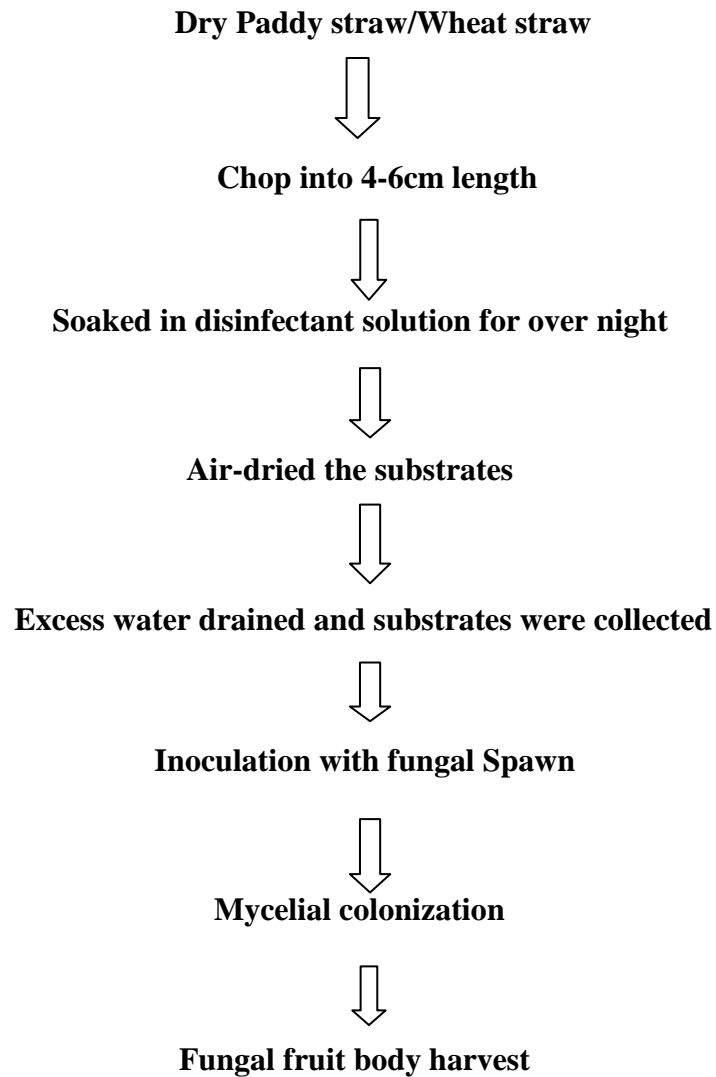
29. Protein content (mg/100 gram)

Dry (20 mg) tissue was crushed with 2.5 ml methanol and a pinch of neutral sand and centrifuged at 5000 rpm for 15 min. The pellet was taken discarding the supernatant. The pellet added with 2.5 ml of 1 M NaOH was kept at 80 °C for 1 hour and cooled at room temperature. The volume was adjusted to the initial level and centrifuged at 10,000 rpm for 15 minut. One tenth of a ml supernatant mixed with 5 ml After 5 min, absorbance was recorded at 595 nm in a UV–vis spectrophotometer (Systronics 117) against a control sample.

Assay method was given by Bradford (1996).

30. Cost benefit ratio

It was taken into the account of overall variable and fixed cost. It can be obtained by total return divided by total cost.

3.6.2. Flow chart of cultivation of *Pleurotus florida* species on different media

3.6.3. Technical Program

A. Details of Experiment

1.	Crop	Oyster Mushroom
2.	Scientific name	<i>Pleurotus florida</i>
3.	Substrates used	Paddy straw and Wheat straw
4.	Experimental design	Completely Randomized Design
5.	Number of treatments	12
6.	Number of replication	3
7.	Total number of Mushroom blocks/bags	36
8.	Area required	4m x 4m = 16 m ²
9.	Floor	Cemented
10.	Roof	Concrete
11.	Window	Ventilated, Wider covered with net
12.	Spawn quantity	5 Kg
13.	Type of bags used	Jute bag and Plastic bag
14.	Chemicals used for sterilization	Carbendazim and Formalin
15.	Place of Research work	Research Laboratory of the Department of Horticulture
16.	Time of the research work	October, 2019 - December, 2019 October, 2020 - December, 2020

3.6.4. Treatments combinations

S. No.	Treatment Symbol	Treatments combination
1.	T ₁	Wheat straw (100%)
2.	T ₂	Paddy straw (100%)
3.	T ₃	Wheat straw (95%) +Paddy straw (5%)
4.	T ₄	Wheat straw (90%) +Paddy straw (10%)
5.	T ₅	Wheat straw (85%) +Paddy straw (15%)
6.	T ₆	Wheat straw (80%) +Paddy straw (20%)
7.	T ₇	Wheat straw (75%) +Paddy straw (25%)
8.	T ₈	Wheat straw (70%) +Paddy straw (30%)
9.	T ₉	Wheat straw (65%) +Paddy straw (35%)
10.	T ₁₀	Wheat straw (60%) +Paddy straw (40%)
11.	T ₁₁	Wheat straw (55%) +Paddy straw (45%)
12.	T ₁₂	Wheat straw (50%) +Paddy straw (50%)

3.6.5. Climatic requirements

Temperature	20-30 ⁰ C
Relative humidity	75% - 85%
Light	200 lux
pH	6.5-7.0
Substrate moisture	65%

3.6.6. List of Glasswares and accessories used in experiment

S. No.	Name of glassware	Supplier
1	Petri plate/disc	Merck Limited, India
2	Test tube	Merck Limited, India
3	Glass rod	Merck Limited, India
4	Wireguose	Merck Limited, India
5	Flasks	Merck Limited, India
6	Wire loop	Hi-Media, India
7	Plastic bottles for preservation	Local supplier
8	Electronic Weigh scale	Systronic, India
9	Polypropylene bag 18*24	Local supplier
10	Stainless still bucket	Local supplier
11	Spatula	Local supplier
12	Plastic bucket	Local supplier
13	Perforated polythene bags	Local supplier
14	Scale	Local supplier
15	String	Local supplier
16	Temperature Humidity meter	Local supplier
17	Aspee pump	Local supplier
18	Labels	Local supplier
19	Knife	Local supplier
20	Hand gloves	Local supplier
21	Magnifying lens	Local supplier
22	Forceps	Local supplier
23	Camera	Cannon SX150IS

3.7. Statistical analysis

The data recorded during the course of experimentation were subjected to statistical analysis of Completely Randomized Design as described by Panse and Sukhtame (1985).

The significance of different treatments effect was judged with the help of 'F' (variance ratio) test. The differences between the significant treatments mean and their interactions were tested against the critical differences at 5 percent, where 'F' test was statistically significant.

3.7.1. ANOVA Table

Source of variation	d.f.	Sum of squares	Mean sum of squares	F. calculated
Replication	$r - 1$	RSS	RMS	RMS / EMS
Treatments	$t - 1$	TrSS	TrMS	TrMS/ EMS
Error	$(r-1)(t-1)$	ESS	EMS	
Total	$rt - 1$	TSS		

Where,

R	=	Number of replication
T	=	Number of treatments
d. f.	=	Degree of freedom
RSS	=	Replication sum of squares
TrSS	=	Treatment sum of squares
ESS	=	Error sum of squares
TSS	=	Total sum of squares
RMS	=	Replication mean sum of squares
TrMS	=	Treatment mean sum of squares
EMS	=	Error mean sum of squares

$$C.V. (\%) = \frac{\sqrt{EMS}}{GM} \times 100$$

$$SE(diff.) = \frac{\sqrt{2EMS}}{GM} \times 100$$

Chapter-IV

Experimental Findings

The findings of the research experiment entitled “**Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions**”. The experiment was carried out in the research laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Rae Bareilly Road, Lucknow, 226 025 (U.P.), India from October 2019 to December 2019 and October 2020 to December 2020. The data recorded for various parameters have been presented in the tables and depicted in figures to provide better understanding and for elucidation of important trends, wherever found necessary. The results of the experiments were statistically analyzed to test their significance and presented under following headlines:

4.1. Length of stipe (cm)

The two year of data (2019 and 2020) pertaining to the length of stipe along with pooled data have been given in Table 4.1. and graphically reflected in fig. 4.1.

During first year of investigation, the results revealed that the length of stipe was significantly influenced with different treatments combination. The maximum length of stipe (3.95 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.85 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 3.77 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 3.77 cm) and T₁ (Wheat straw 100%, 3.55 cm). The minimum length of stipe was recorded in treatment T₂ (Paddy straw 100%, 3.35 cm). The general mean for this character was 3.69 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (3.85 cm) treatment.

During the second year of the investigation, the results showed that the length of stipe was also significantly influenced with different treatments combination. The maximum length of stipe (3.92 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.84 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 3.78 cm), T₃

(Wheat straw 95% + Paddy straw 5%, 3.71 cm) and T₁ (Wheat straw 100%, 3.76 cm). The

Table- 4.1 : The effect of different treatments combination on length of stipe (cm) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	3.76	3.71	3.73
T ₂	Paddy straw (100%)	3.35	3.61	3.48
T ₃	Wheat straw (95%) + Paddy straw (5%)	3.77	3.76	3.76
T ₄	Wheat straw (90%) + Paddy straw (10%)	3.77	3.78	3.77
T ₅	Wheat straw (85%) +Paddy straw (15%)	3.85	3.84	3.85
T ₆	Wheat straw (80%) +Paddy straw (20%)	3.95	3.92	3.94
T ₇	Wheat straw (75%) +Paddy straw (25%)	3.74	3.75	3.74
T ₈	Wheat straw (70%) +Paddy straw (30%)	3.73	3.75	3.74
T ₉	Wheat straw (65%) +Paddy straw (35%)	3.68	3.72	3.70
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	3.57	3.68	3.63
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	3.55	3.63	3.59
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	3.53	3.62	3.58
	General mean	3.69	3.73	3.71
	S.Em (±)	0.04	0.04	0.03
	C.D. at 5%	0.13	0.10	0.09

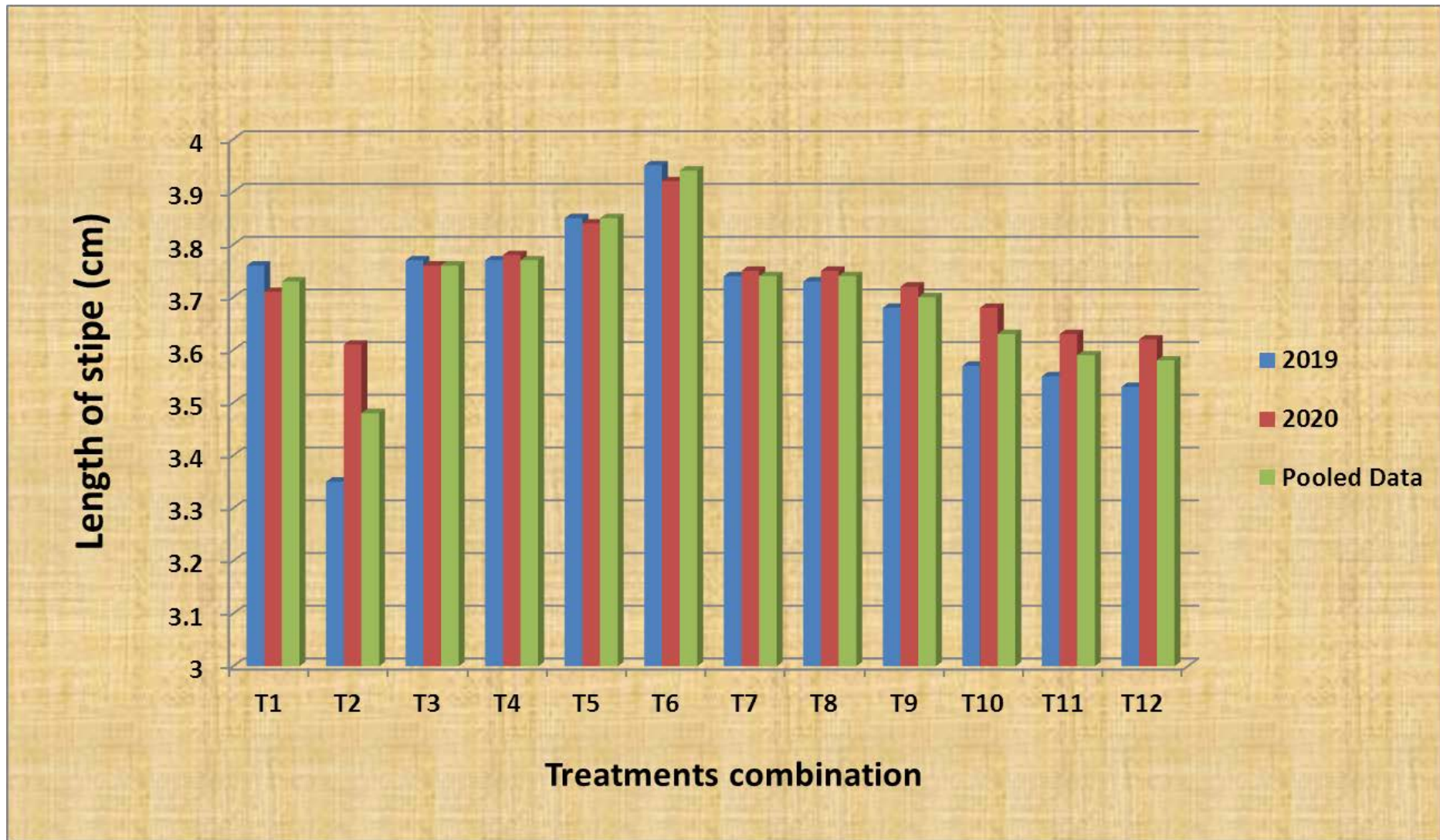


Fig.4.1: The effect of different treatments combination on length of stipe (cm) of Oyster mushroom

minimum length of stipe was recorded in treatment T₂ (Paddy straw 100%, 3.61 cm). The general mean for this character was 3.73 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (3.84 cm) treatment.

Findings based on pooled data revealed that treatment on the length of stipe was significantly influenced with different treatments combination. The maximum length of stipe (3.94 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.85 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 3.77 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 3.76 cm), and T₁ (Wheat straw 100%, 3.76 cm). The minimum length of stipe was recorded in treatment T₂ (Paddy straw 100%, 3.48 cm). The general mean for this character was 3.71 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (3.85 cm) treatment.

4.2. Diameter of stipe (cm)

The two year of data (2019 and 2020) pertaining to the diameter of stipe along with pooled data have been given in Table 4.2. and graphically reflected in fig. 4.2.

During first year of investigation, the results revealed that the diameter of stipe was significantly influenced with different treatments combination. The maximum diameter of stipe (1.21 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 1.17 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 1.10 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 1.00 cm) and T₁ (Wheat straw 100%, 1.00 cm). The minimum length of stipe was recorded in treatment T₂ (Paddy straw 100%, 0.82 cm). The general mean for this character was 0.96 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (1.17 cm) and T₄ (1.10 cm) treatments.

During the second year of the investigation, the results showed that the diameter of stipe was significantly influenced with different treatments combination. The maximum diameter of stipe (1.24 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 1.16 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 1.09 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 1.00 cm), and T₁ (Wheat straw 100%, 1.00 cm). The minimum length of stipe was recorded in treatment T₂ (Paddy straw 100%, 0.76 cm). The general mean for this character was 0.95 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (1.16 cm) and T₄ (1.09 cm).

Table- 4.2 : The effect of different treatments combination on diameter of stipe (cm) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	0.87	1.00	0.94
T ₂	Paddy straw (100%)	0.82	0.76	0.79
T ₃	Wheat straw (95%) +Paddy straw (5%)	1.00	1.00	1.00
T ₄	Wheat straw (90%) +Paddy straw (10%)	1.10	1.09	1.09
T ₅	Wheat straw (85%) +Paddy straw (15%)	1.17	1.16	1.16
T ₆	Wheat straw (80%) +Paddy straw (20%)	1.21	1.24	1.23
T ₇	Wheat straw (75%) +Paddy straw (25%)	0.98	0.94	0.96
T ₈	Wheat straw (70%) +Paddy straw (30%)	0.87	0.88	0.87
T ₉	Wheat straw (65%) +Paddy straw (35%)	0.90	0.86	0.88
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	0.86	0.83	0.84
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	0.86	0.82	0.84
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	0.83	0.81	0.82
	General mean	0.96	0.95	0.95
	S.Em (\pm)	0.04	0.04	0.03
	C.D. at 5%	0.12	0.10	0.07

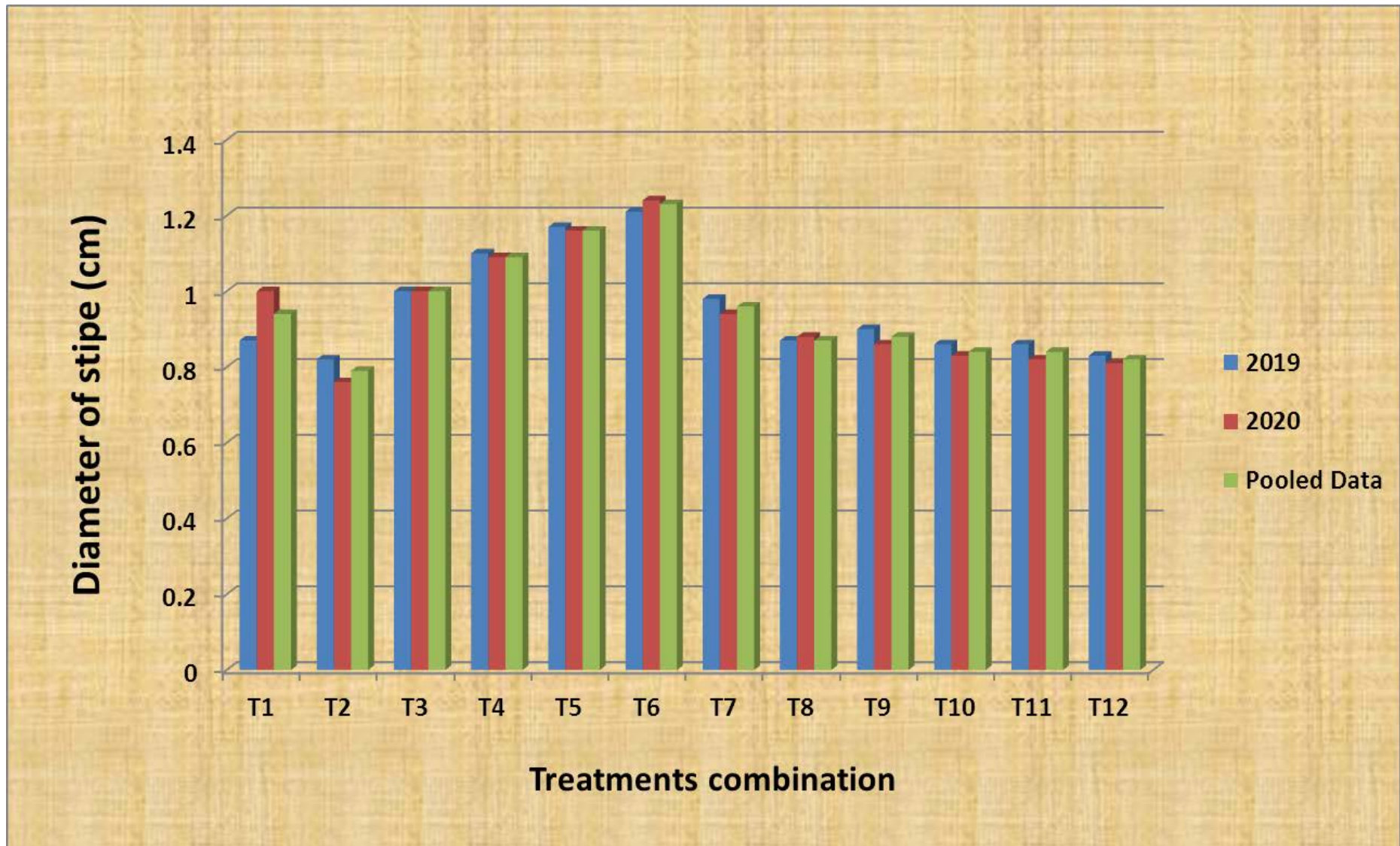


Fig.4.2: The effect of different treatments combination on diameter of stipe (cm) of Oyster mushroom

Findings based on pooled data revealed that treatment, the diameter of stipe was significantly influenced with different treatments combination. The maximum diameter of stipe (1.23 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 1.16 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 1.09 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 1.00 cm) and T₁ (Wheat straw 100%, 0.94 cm). The minimum length of stipe was recorded in treatment T₂ (Paddy straw 100%, 0.94 cm). The general mean for this character was 0.95 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (1.16 cm) treatment.

4.3. Diameter of pileus (cm)

The two year of data (2019 and 2020) pertaining to the diameter of pileus along with pooled data have been given in Table 4.3. and graphically reflected in Fig. 4.3.

During the first year of the investigation, the results showed that the diameter of pileus was significantly influenced with different treatments combination. The maximum diameter of pileus (4.49 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 4.43 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 4.43 cm), T₁ (Wheat straw 100%, 4.41 cm) and T₃ (Wheat straw 85% + Paddy straw 15%, 4.40 cm). The minimum diameter of pileus was recorded in treatment T₂ (Paddy straw 100%, 3.50 cm). The general mean for this character was 4.07 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (4.43 cm), T₄ (4.43 cm), T₁ (4.41 cm) and T₃ (4.40 cm) treatments.

During second year of investigation, the results also observe that the diameter of pileus was significantly influenced with different treatments combination. The maximum diameter of pileus (4.45 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 4.39 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 4.33 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 4.33 cm) and T₁ (Wheat straw 100%, 4.13 cm). The minimum diameter of pileus was recorded in treatment T₂ (Paddy straw 100%, 3.53 cm). The general mean for this character was 4.05 cm. The treatment T₆ (Wheat straw 80% +

Table- 4.3 : The effect of different treatments combination on diameter of pileus (cm) of Oyster mushroom

Symbol	Treatments combination	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	4.41	4.13	4.27
T ₂	Paddy straw (100%)	3.50	3.53	3.52
T ₃	Wheat straw (95%) +Paddy straw (5%)	4.40	4.33	4.37
T ₄	Wheat straw (90%) +Paddy straw (10%)	4.43	4.33	4.38
T ₅	Wheat straw (85%) +Paddy straw (15%)	4.43	4.39	4.41
T ₆	Wheat straw (80%) +Paddy straw (20%)	4.49	4.45	4.47
T ₇	Wheat straw (75%) +Paddy straw (25%)	4.10	4.03	4.07
T ₈	Wheat straw (70%) +Paddy straw (30%)	4.03	4.00	4.02
T ₉	Wheat straw (65%) +Paddy straw (35%)	3.97	3.97	3.97
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	3.83	3.93	3.88
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	3.63	3.90	3.77
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	3.60	3.63	3.62
	General mean	4.07	4.05	4.06
	S.Em (±)	0.11	0.12	0.08
	C.D. at 5%	0.31	0.35	0.22

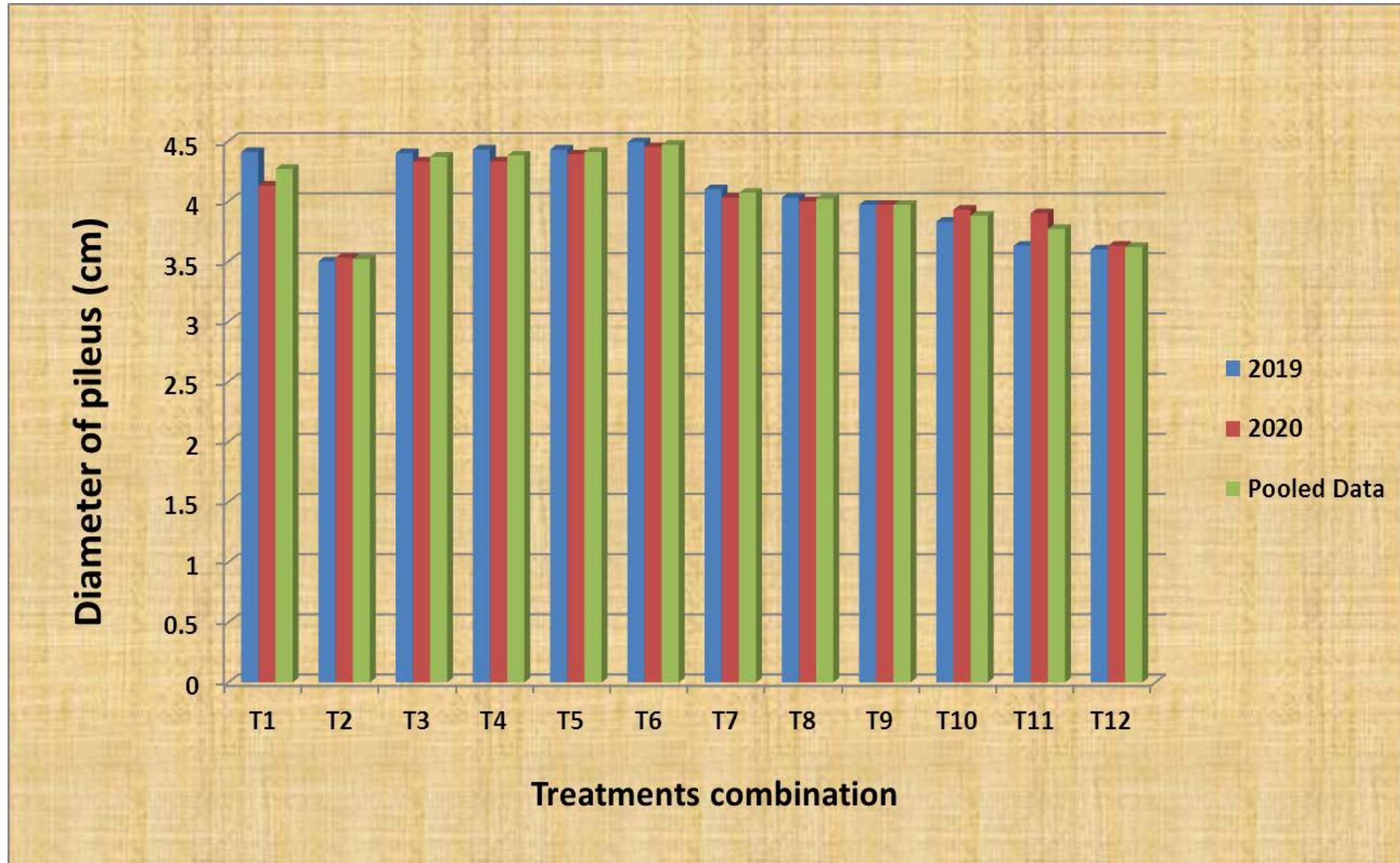


Fig. 4.3: The effect of different treatments combination on diameter of pileus (cm) of Oyster mushroom

Paddy straw 20%) was statistically at par with T₅ (4.39 cm), T₄ (4.33 cm), T₃ (4.33 cm) and T₁ (4.13 cm) treatments.

Findings based on pooled data evident that the diameter of pileus was significantly influenced with different treatments combination. The maximum diameter of pileus (4.47 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 4.41 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 4.38 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 4.37 cm) and T₁ (Wheat straw 100%, 4.27 cm). The minimum diameter of pileus was recorded in treatment T₂ (Paddy straw 100%, 3.52 cm). The general mean for this character was 4.06 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (4.41 cm), T₄ (4.38 cm), T₃ (4.37 cm) and T₁ (4.27 cm) treatments.

4.4. Diameter of fruiting bodies (cm)

The two year of data (2019 and 2020) pertaining to the diameter of fruiting bodies along with pooled data have been presented in Table 4.4. and graphically depicted in Fig. 4.4.

During the first year of the investigation, the results exhibited that the diameter of fruiting bodies was significantly influenced with different treatments combination. The maximum diameter of fruiting bodies (12.20 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 12.17 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 12.07 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 12.03 cm), T₁ (Wheat straw 100%, 12.03 cm) and T₇ (Wheat straw 75% + Paddy straw 25%, 12.00 cm). The minimum diameter of fruiting bodies was recorded in treatment T₂ (Paddy straw 100%, 8.60 cm). The general mean for this character was 11.03 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (12.17 cm), T₄ (12.07 cm), T₃ (12.03 cm), T₁ (12.03 cm) and T₇ (12.00 cm) treatments.

During second year of investigation, the results also showed that the diameter of fruiting bodies was significantly influenced with different treatments combination. The maximum diameter of fruiting bodies (12.43 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 12.40 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 12.37 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 12.30 cm) T₁ (Wheat straw 100%, 12.27 cm)

Table- 4.4: The effect of different treatments combination on diameter of fruiting bodies (cm) of Oyster mushroom

Symbol	Treatments combination	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	12.03	12.27	12.15
T ₂	Paddy straw (100%)	8.60	8.77	8.68
T ₃	Wheat straw (95%) +Paddy straw (5%)	12.03	12.30	12.17
T ₄	Wheat straw (90%) +Paddy straw (10%)	12.07	12.37	12.22
T ₅	Wheat straw (85%) +Paddy straw (15%)	12.17	12.40	12.28
T ₆	Wheat straw (80%) +Paddy straw (20%)	12.20	12.43	12.32
T ₇	Wheat straw (75%) +Paddy straw (25%)	12.00	12.13	12.07
T ₈	Wheat straw (70%) +Paddy straw (30%)	11.53	12.03	11.78
T ₉	Wheat straw (65%) +Paddy straw (35%)	11.20	11.50	11.35
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	10.07	10.43	10.25
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	9.70	9.77	9.73
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	8.73	9.13	8.93
	General mean	11.03	11.29	11.16
	S.Em (\pm)	0.12	0.15	0.15
	C.D. at 5%	0.35	0.45	0.31

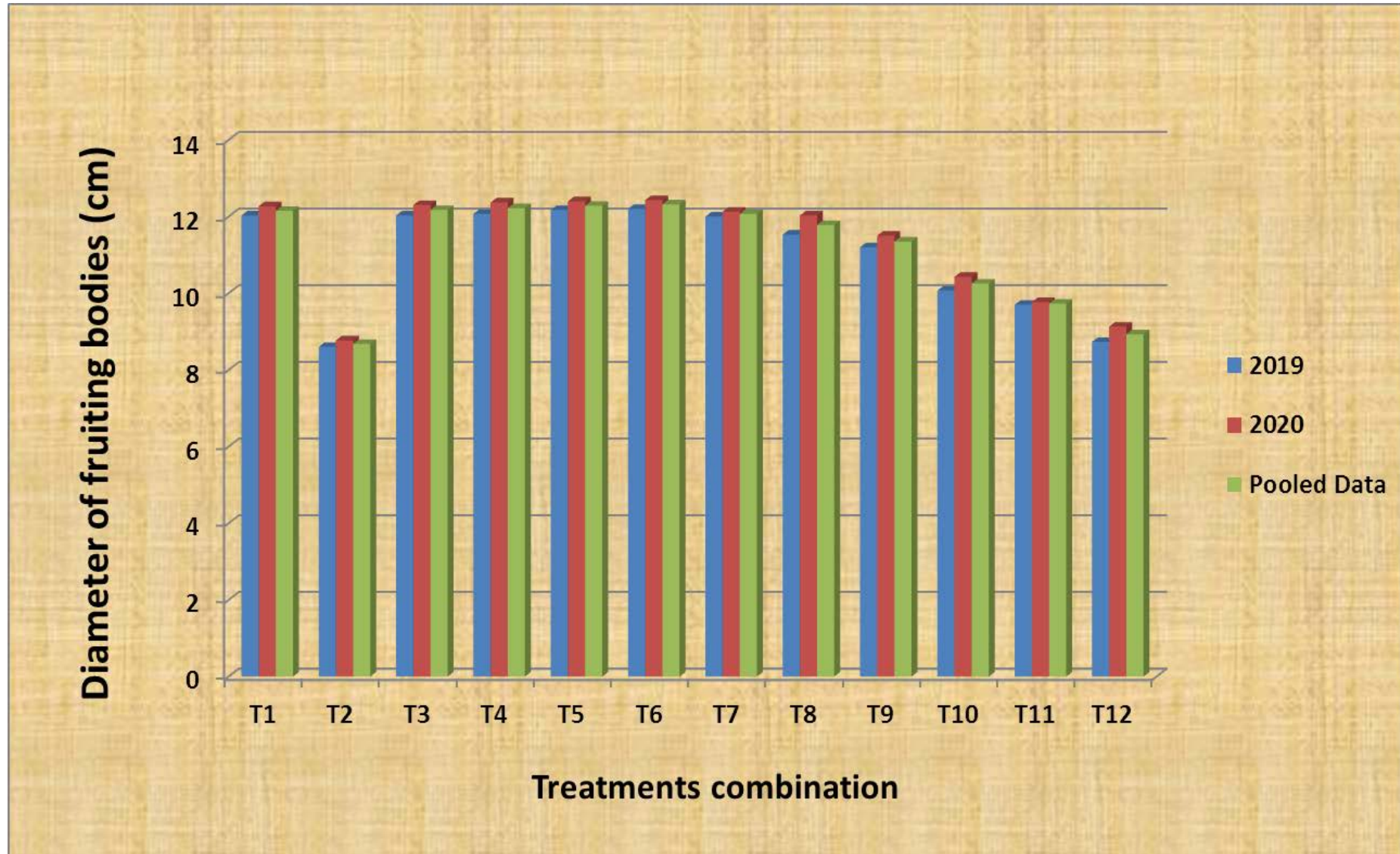


Fig. 4.4: The effect of different treatments combination on diameter of fruiting bodies of Oyster mushroom

and T₇ (Wheat straw 75% + Paddy straw 25%, 12.13 cm). The minimum diameter of fruiting bodies was recorded in treatment T₂ (Paddy straw 100%, 8.77 cm). The general mean for this character was 11.29 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (12.43 cm), T₄ (12.40 cm), T₃ (12.30 cm), T₁ (12.27 cm), T₇ (12.13 cm) and T₈ (12.03 cm) treatments.

Findings based on pooled data revealed that on the diameter of fruiting bodies was significantly influenced with different treatment combination. The maximum diameter of fruiting bodies (12.32 cm) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 12.28 cm), T₄ (Wheat straw 90% + Paddy straw 10%, 12.22 cm), T₃ (Wheat straw 85% + Paddy straw 15%, 12.17 cm), T₁ (Wheat straw 100%, 12.15 cm) and T₇ (Wheat straw 75% + Paddy straw 25%, 12.01 cm). The minimum diameter of fruiting bodies was recorded in treatment T₂ (Paddy straw 100%, 8.68 cm). The general mean for this character was 11.16 cm. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (12.28 cm), T₄ (12.22 cm), T₃ (12.17 cm), T₁ (12.15 cm) and T₇ (12.07 cm).

4.5. Primordial initiation days of Oyster mushroom

The two year of data (2019 and 2020) pertaining to the primordial initiation days along with pooled data have been given in Table 4.5. and graphically reflected in Fig. 4.5.

During the first year of the investigation, the results revealed that number of days taken to primordial initiation was significantly influenced with different treatments combination. The minimum number of days taken to primordial initiation (20.33 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 21.00 days), T₄ (Wheat straw 90% + Paddy straw 10%, 21.33 days), T₃ (Wheat straw 85% + Paddy straw 15%, 21.67 days) and T₁ (Wheat straw 100%, 21.67 days), whereas maximum days (24.33 days) was taken to days of primordial initiation was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (21.00 days) and T₄ (21.33 days) treatments.

Table- 4.5: The effect of different treatments combination on primordial initiation days of Oyster mushroom

Symbol	Treatments combination	2019	2020	Pooled Data
T ₁	Wheat straw 100%)	21.67	22.00	21.83
T ₂	Paddy straw (100%)	24.33	24.67	24.50
T ₃	Wheat straw (95%) +Paddy straw (5%)	21.67	22.00	21.83
T ₄	Wheat straw (90%) +Paddy straw (10%)	21.33	21.67	21.50
T ₅	Wheat straw (85%) +Paddy straw (15%)	21.00	21.33	21.17
T ₆	Wheat straw (80%) +Paddy straw (20%)	20.33	21.00	20.67
T ₇	Wheat straw (75%) +Paddy straw (25%)	22.00	22.00	22.00
T ₈	Wheat straw (70%) +Paddy straw (30%)	22.33	22.33	22.33
T ₉	Wheat straw (65%) +Paddy straw (35%)	22.67	23.33	23.00
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	23.33	24.00	23.67
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	23.67	24.33	24.00
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	24.00	24.33	24.17
	General mean	22.36	22.75	22.56
	S.Em (\pm)	0.44	0.61	0.35
	C.D. at 5%	1.29	1.78	0.99

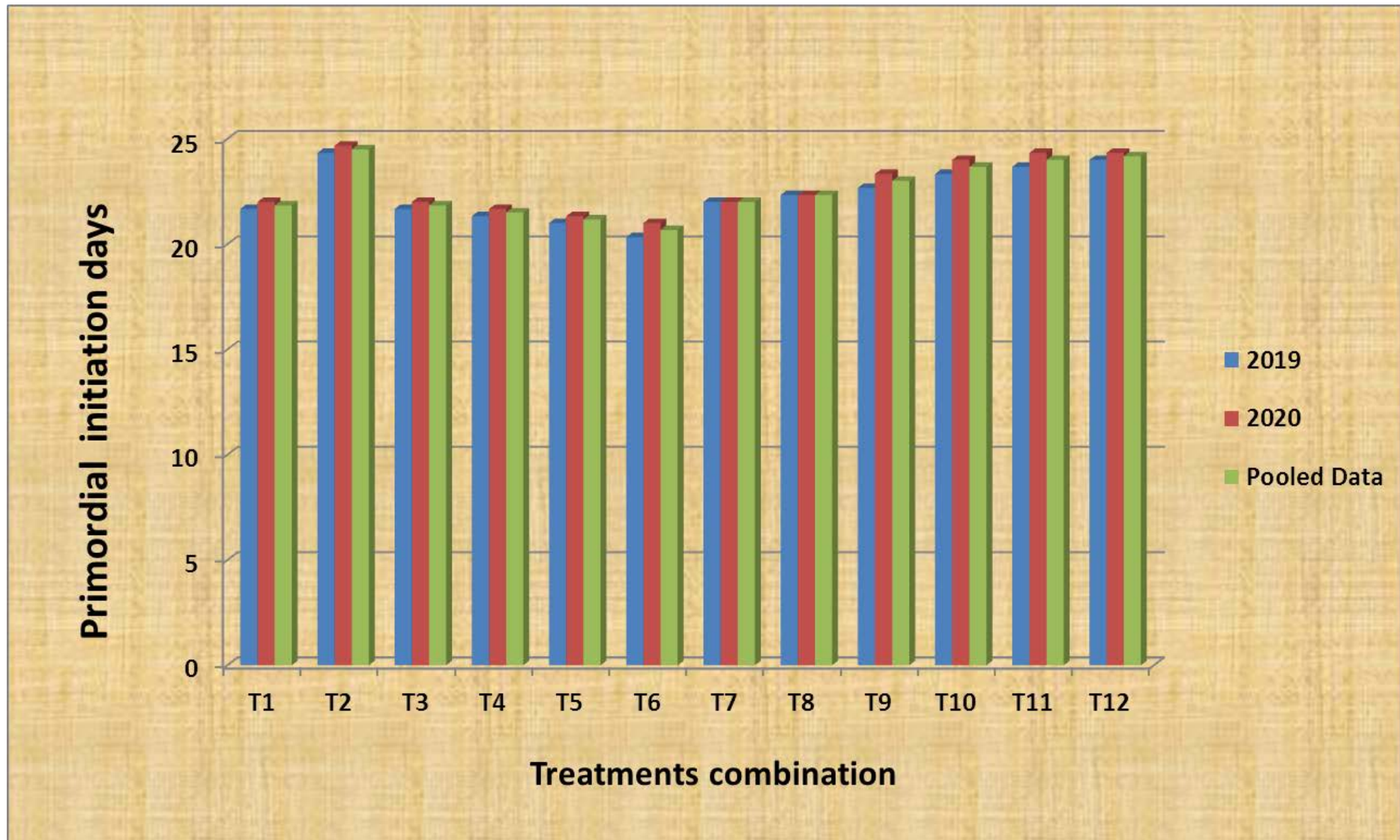


Fig. 4.5: The effect of different treatments combination on primordial initiation days of Oyster mushroom

During the second year of the investigation, the results also showed that number of days taken to primordial initiation was significantly influenced with different treatments combination. The minimum number of days taken to primordial initiation (21.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 21.33 days), T₄ (Wheat straw 90% + Paddy straw 10%, 21.67 days), T₃ (Wheat straw 85% + Paddy straw 15%, 22.00 days) and T₁ (Wheat straw 100%, 22.00 days), whereas maximum days (24.67 days) was taken to days of primordial initiation was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (21.33 days) and T₄ (21.67 days) treatments

Findings based on pooled data clearly revealed that the treatment on the number of days taken to primordial initiation was significantly influenced with different treatments combination. The minimum number of days taken to primordial initiation (20.67 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 21.17 days), T₄ (Wheat straw 90% + Paddy straw 10%, 21.50 days), T₃ (Wheat straw 85% + Paddy straw 15%, 21.83 days) and T₁ (Wheat straw 100%, 21.83 days), whereas maximum days (24.50 days) was taken to days of primordial initiation was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (21.17 days) and T₄ (21.50 days) treatments

4.6. Pinhead formation days

The two year of data (2019 and 2020) pertaining to the pinhead formation days along with pooled data have been presented in Table 4.6. and graphically reflected in Fig. 4.6.

During the first year of the investigation, the results showed that number of days taken to pinhead formation was significantly influenced with different treatments combination. The minimum number of days taken to pinhead formation (24.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 24.33 days), T₄

Table- 4.6: The effect of different treatments combination on pinhead formation days of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	25.00	26.00	25.50
T ₂	Paddy straw (100%)	27.00	27.67	27.33
T ₃	Wheat straw (95%) +Paddy straw (5%)	24.67	26.00	25.33
T ₄	Wheat straw (90%) +Paddy straw (10%)	24.67	25.00	24.83
T ₅	Wheat straw (85%) +Paddy straw (15%)	24.33	24.67	24.50
T ₆	Wheat straw (80%) +Paddy straw (20%)	24.00	24.00	24.00
T ₇	Wheat straw (75%) +Paddy straw (25%)	25.00	26.33	25.67
T ₈	Wheat straw (70%) +Paddy straw (30%)	25.33	26.33	25.83
T ₉	Wheat straw (65%) +Paddy straw (35%)	25.67	26.67	26.17
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	26.00	27.00	26.50
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	26.00	27.00	26.50
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	26.33	27.33	26.83
	General mean	25.33	24.94	25.14
	S.Em (±)	0.67	0.58	0.57
	C.D. at 5%	1.97	1.69	1.62

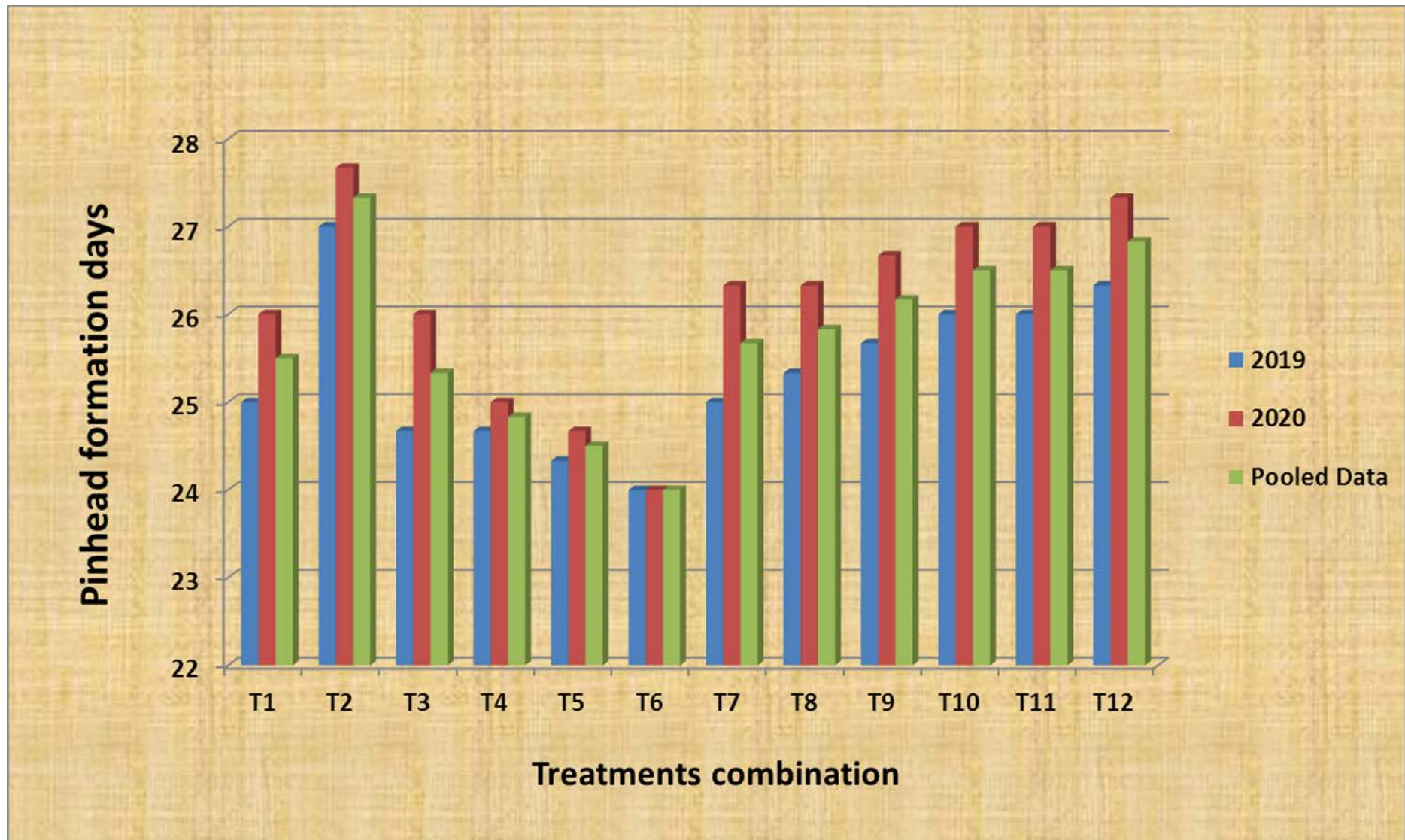


Fig. 4.6: The effect of different treatments combination on pinhead formation days of Oyster mushroom

(Wheat straw 90% + Paddy straw 10%, 24.67 days), T₃ (Wheat straw 85% + Paddy straw 15%, 24.67 days), T₁ (Wheat straw 100%, 25.00 days) and T₇ (Wheat straw 75% + Paddy straw 25%, 25.00 days), whereas maximum days (27.00 days) was taken to days of pinhead formation was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (24.33 days), T₄ (24.67 days), T₃ (24.67 days), T₁ (25.00 days), T₇ (25.00 days) and T₈ (25.33 days) treatments

During the second year of the investigation, the results also exhibited that number of days taken to pinhead formation was significantly influenced with different treatments combination. The minimum number of days taken to pinhead formation (24.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 24.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 25.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 26.00 days) and T₁ (Wheat straw 100%, 26.00 days) whereas maximum days (27.67 days) was taken to days of pinhead formation was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (24.67 days), T₄ (25.00 days) and T₃ (26.00 days).

Findings based on pooled data revealed that treatment on the number of days taken to pinhead formation was significantly influenced with different treatment combination. The minimum number of days taken to pinhead formation (24.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 24.50 days), T₄ (Wheat straw 90% + Paddy straw 10%, 24.83 days), T₃ (Wheat straw 85% + Paddy straw 15%, 25.33 days) and T₁ (Wheat straw 100%, 25.50 days), whereas maximum days (27.33 days) was taken to days of pinhead formation was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (24.50 days), T₄ (24.83 days), T₃ (25.33 days) and T₁ (25.50 days).

Table- 4.7: The effect of different treatments combination on maturity time of sporophore of Oyster mushroom

Symbol	Treatments combination	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	29.00	29.00	28.67
T ₂	Paddy straw (100%)	30.00	31.00	30.50
T ₃	Wheat straw (95%) +Paddy straw (5%)	28.00	28.67	28.33
T ₄	Wheat straw (90%) +Paddy straw (10%)	27.67	28.00	27.83
T ₅	Wheat straw (85%) +Paddy straw (15%)	27.33	27.67	27.50
T ₆	Wheat straw (80%) +Paddy straw (20%)	27.00	27.33	27.17
T ₇	Wheat straw (75%) +Paddy straw (25%)	28.33	29.33	28.83
T ₈	Wheat straw (70%) +Paddy straw (30%)	28.67	29.67	29.17
T ₉	Wheat straw (65%) +Paddy straw (35%)	28.00	30.00	29.00
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	28.67	30.00	29.33
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	29.00	30.33	29.67
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	29.33	30.67	30.00
	General mean	28.36	28.03	28.19
	S.Em (\pm)	0.42	0.48	0.37
	C.D. at 5%	1.22	1.40	1.05

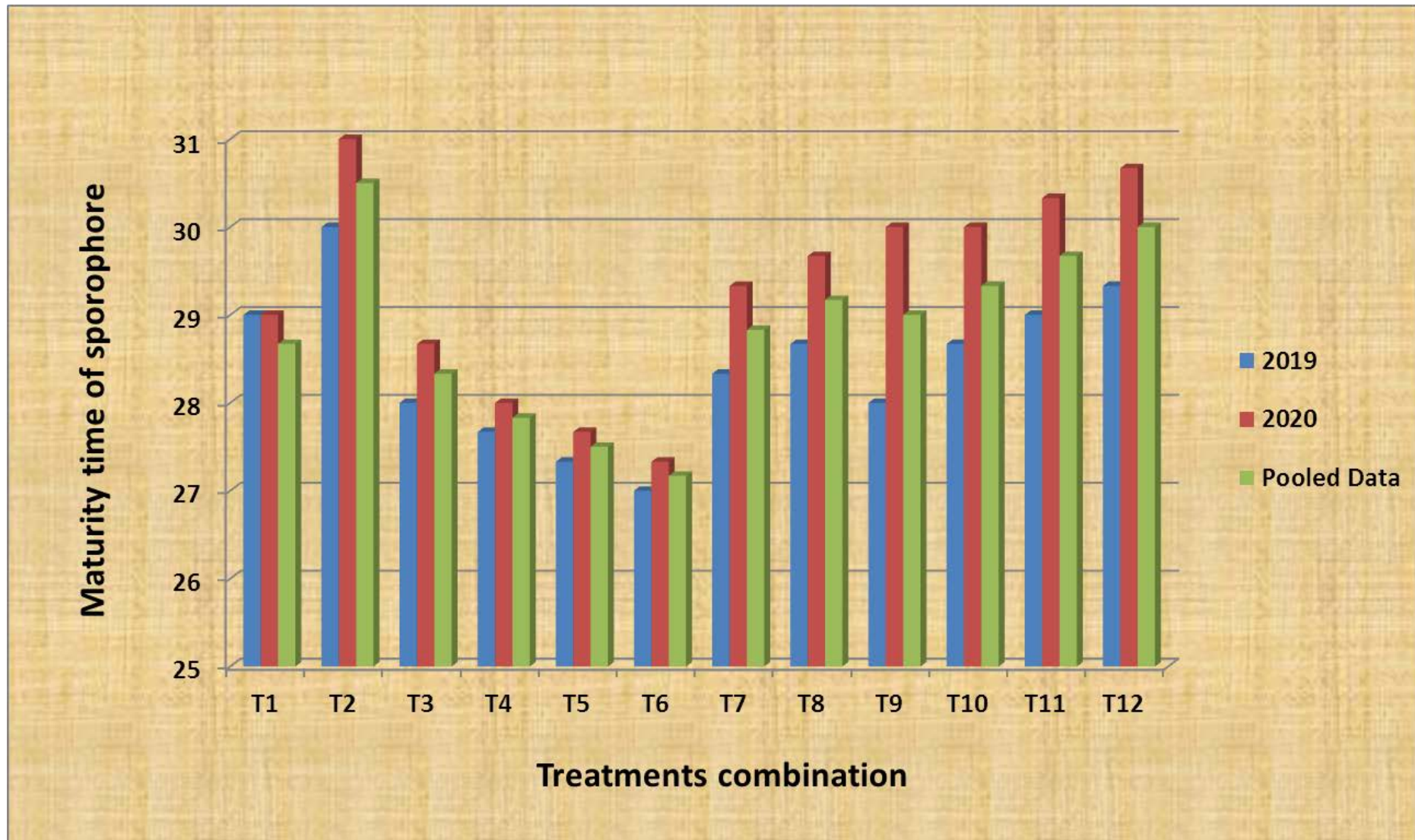


Fig 4.7: The effect of different treatments combination on maturity time of sporophore of Oyster mushroom

4.7. Maturity time of sporophore

The two year of data (2019 and 2020) pertaining to the maturity time of sporophore along with pooled data have been presented in Table 4.6. and graphically reflected in Fig. 4.6.

During the first year of the investigation, the results showed that maturity time of sporophore was significantly influenced with different treatments combination. The minimum maturity time of sporophore (27.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 27.33 days), T₄ (Wheat straw 90% + Paddy straw 10%, 27.67 days), T₃ (Wheat straw 85% + Paddy straw 15%, 28.00 days), T₁ (Wheat straw 100%, 29.00 days) and T₇ (Wheat straw 75% +Paddy straw 25%, 28.33 days), whereas maximum days (30.00 days) was taken to days of maturity time of sporophore was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (27.33 days), T₄ (27.67 days) and T₃ (28.00 days) treatments.

During the second year of the investigation, the results showed that maturity time of sporophore was also significantly influenced with different treatments combination. The minimum maturity time of sporophore (27.33 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 27.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 28.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 28.67 days), T₁ (Wheat straw 100%, 29.00 days) and T₇ (Wheat straw 75% +Paddy straw 25%, 29.33 days)., whereas maximum days (31.00 days) was taken to days of maturity time of sporophore was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (27.67 days), T₄ (28.00 days) and T₃ (28.67 days) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on maturity time of sporophore of different treatments combination. The minimum maturity time of sporophore (27.17 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85%

Table- 4.8: The effect of different treatments combination on days required to pin head initiation to first harvest of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	4.67	4.33	4.50
T ₂	Paddy straw (100%)	5.00	5.67	5.33
T ₃	Wheat straw (95%) +Paddy straw (5%)	4.67	4.33	4.50
T ₄	Wheat straw (90%) +Paddy straw (10%)	4.00	4.00	4.00
T ₅	Wheat straw (85%) +Paddy straw (15%)	3.67	3.67	3.67
T ₆	Wheat straw (80%) +Paddy straw (20%)	3.00	3.00	3.00
T ₇	Wheat straw (75%) +Paddy straw (25%)	4.00	4.33	4.17
T ₈	Wheat straw (70%) +Paddy straw (30%)	4.33	4.67	4.50
T ₉	Wheat straw (65%) +Paddy straw (35%)	5.00	4.67	4.83
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	4.00	5.00	4.50
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	4.67	5.33	5.00
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	4.33	5.33	4.83
	General mean	4.28	4.53	4.40
	S.Em (±)	0.37	0.41	0.27
	C.D. at 5%	1.09	1.19	0.68

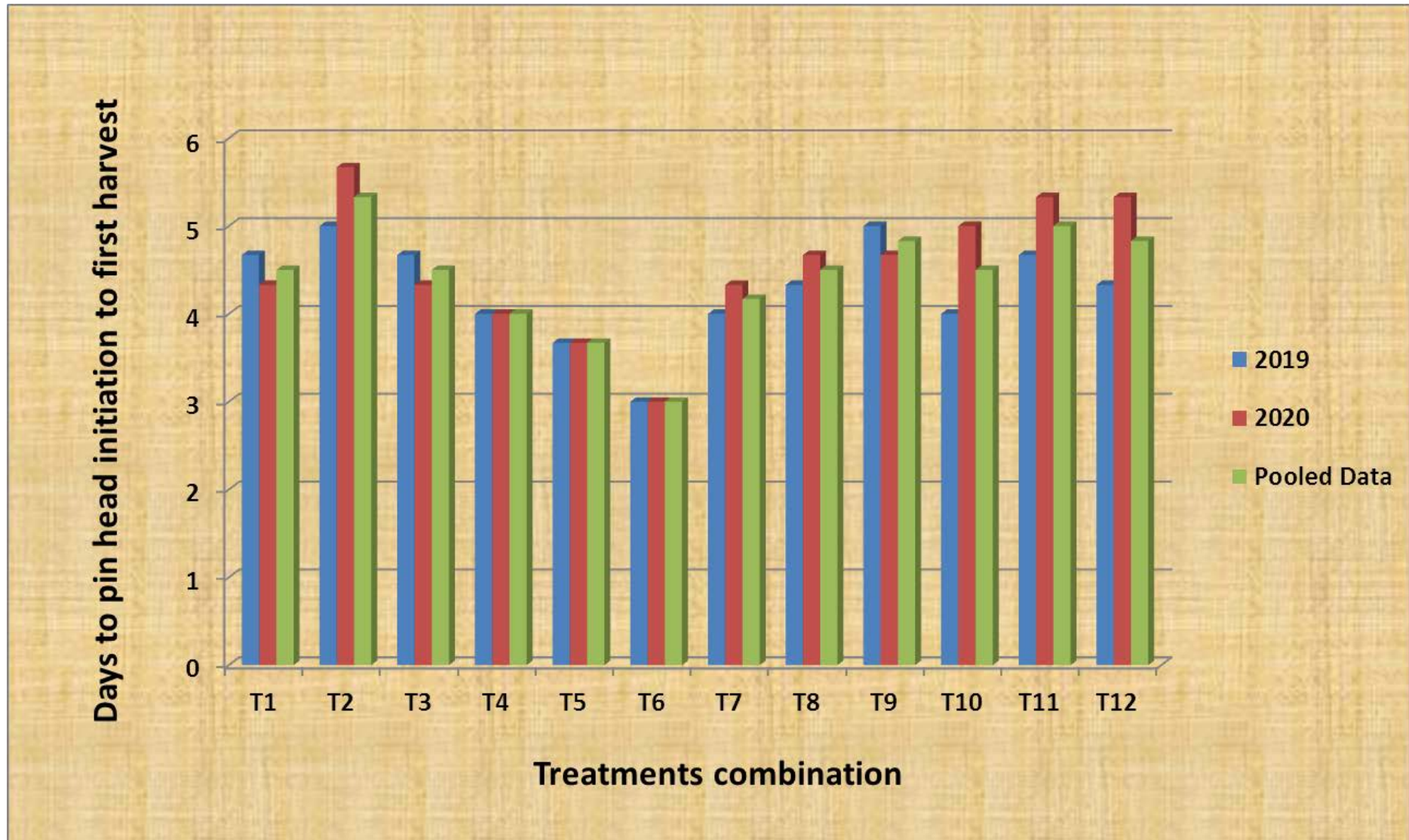


Fig. 4.8: The effect of different treatments combination on days required to pin head initiation to first harvest of Oyster mushroom

+ Paddy straw 15%, 27.50 days), T₄ (Wheat straw 90% + Paddy straw 10%, 27.83 days), T₃ (Wheat straw 85% + Paddy straw 15%, 28.33 days), T₁ (Wheat straw 100%, 28.67 days) and T₇ (Wheat straw 75% + Paddy straw 25%, 28.83 days), whereas maximum days (30.50 days) was taken to days of maturity time of sporophore was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (27.50 days), T₄ (27.83 days) and T₃ (28.33 days) treatments.

4.8. Days to pin head initiation to first harvest

The two year of data (2019 and 2020) pertaining to the days to pin head initiation to first harvest along with pooled data have been presented in Table 4.8. and graphically represented in Fig. 4.8.

During the first year of the investigation, the results showed that days to pin head initiation to first harvest was significantly influenced with different treatments combination. The minimum days to pin head initiation to first harvest (3.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 4.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 4.67 days) and T₁ (Wheat straw 100%, 4.67 days), whereas maximum days (5.00 days) was taken to days to pin head initiation to first harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (3.67 days) and T₄ (4.00 days) treatments.

During the second year of the investigation, the results showed that days to pin head initiation to first harvest was significantly influenced with different treatments combination. The minimum days to pin head initiation to first harvest (3.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 4.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 4.33 days) and T₁ (Wheat straw 100%, 4.33 days), whereas maximum days (5.67 days) was taken to days to pin head initiation to first harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy

Table- 4.9: The effect of different treatments combination on days required to pin head initiation to second harvest of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	12.33	12.67	12.50
T ₂	Paddy straw (100%)	13.67	14.33	14.00
T ₃	Wheat straw (95%) +Paddy straw (5%)	12.00	12.33	12.17
T ₄	Wheat straw (90%) +Paddy straw (10%)	11.67	12.00	11.83
T ₅	Wheat straw (85%) +Paddy straw (15%)	11.00	11.67	11.33
T ₆	Wheat straw (80%) +Paddy straw (20%)	10.67	11.00	10.83
T ₇	Wheat straw (75%) +Paddy straw (25%)	12.33	12.67	12.50
T ₈	Wheat straw (70%) +Paddy straw (30%)	12.67	13.00	12.83
T ₉	Wheat straw (65%) +Paddy straw (35%)	12.67	13.33	13.00
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	13.00	13.67	13.33
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	13.33	13.67	13.50
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	13.33	14.00	13.67
	General mean	12.39	12.86	12.63
	S.Em (±)	0.55	0.62	0.39
	C.D. at 5%	1.61	1.80	1.09

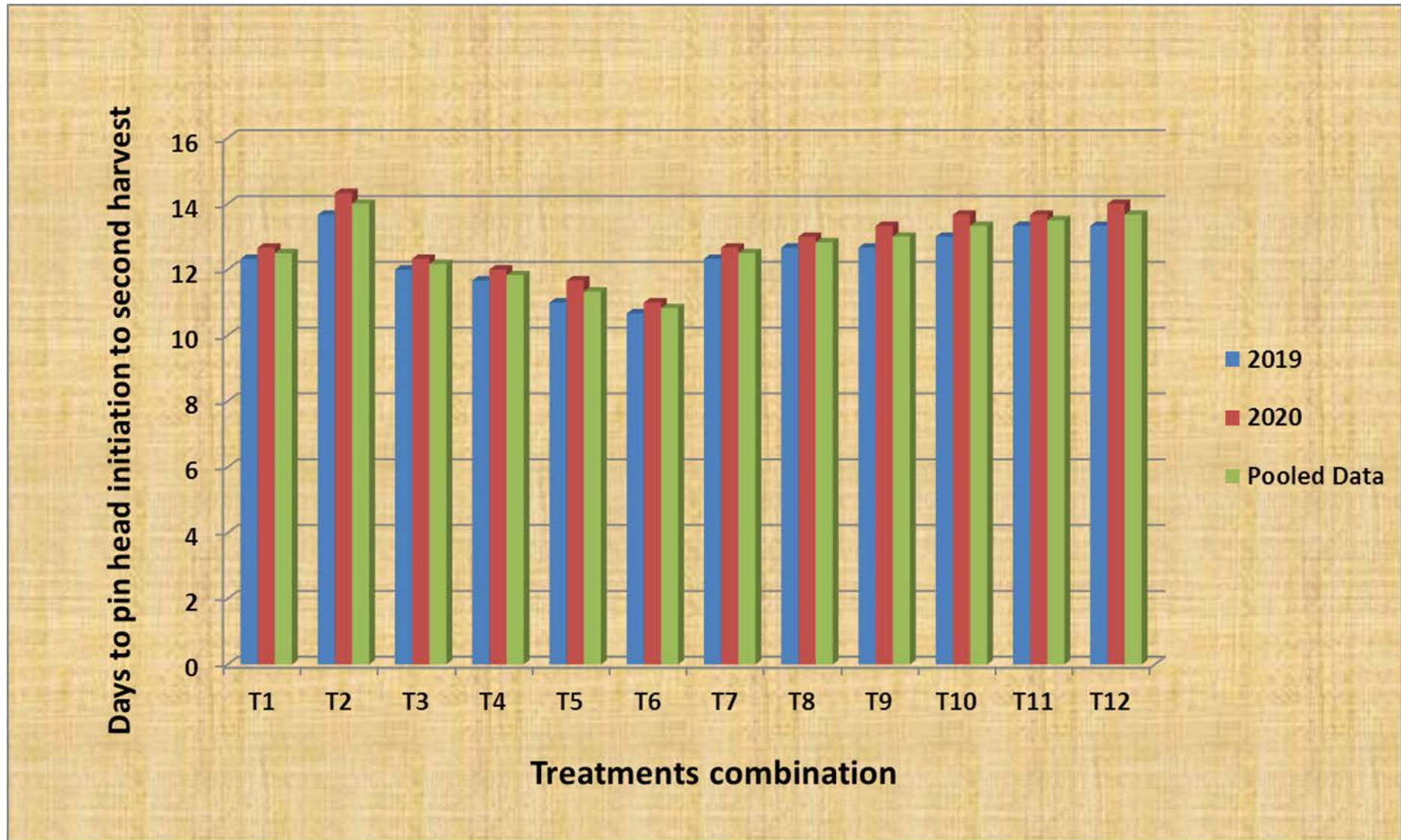


Fig.4.9: The effect of different treatments combination on days required to pin head initiation to second harvest of Oyster mushroom

straw 20%) was statistically at par with the T₅ (3.67 days) and T₄ (4.00 days) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on days to pin head initiation to first harvest different treatments combination. The minimum days to pin head initiation to first harvest (3.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 4.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 4.50 days) and T₁ (Wheat straw 100%, 4.50 days), whereas maximum days (5.33 days) was taken to days to pin head initiation to first harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (3.67 days) and T₄ (4.00 days) treatments.

4.9. Days to pin head initiation to second harvest

The two year of data (2019 and 2020) pertaining to the days to pin head initiation to second harvest along with pooled data have been presented in Table 4.9. and graphically depicted in Fig. 4.9.

During the first year of the investigation, the results showed that days to pin head initiation to second harvest was significantly influenced with different treatments combination. The minimum days to pin head initiation to second harvest (10.67 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 11.00 days), T₄ (Wheat straw 90% + Paddy straw 10%, 11.67 days), T₃ (Wheat straw 85% + Paddy straw 15%, 12.00 days) and T₁ (Wheat straw 100%, 12.33 days), whereas maximum days (13.67 days) was taken to days to pin head initiation to first harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (11.00 days), T₄ (11.67 days) and T₃ (12.00 days) treatments.

During the second year of the investigation, the results showed that days to pin head initiation to second harvest was significantly influenced with different treatments combination. The minimum days to pin head initiation to second harvest

Table- 4.10: The effect of different treatments combination on days required to pin head initiation to third harvest of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	20.67	20.67	20.67
T ₂	Paddy straw (100%)	22.67	23.33	23.00
T ₃	Wheat straw (95%) +Paddy straw (5%)	20.33	20.33	20.33
T ₄	Wheat straw (90%) +Paddy straw (10%)	20.00	20.00	20.00
T ₅	Wheat straw (85%) +Paddy straw (15%)	19.33	19.67	19.50
T ₆	Wheat straw (80%) +Paddy straw (20%)	18.33	19.00	18.67
T ₇	Wheat straw (75%) +Paddy straw (25%)	21.00	21.00	21.00
T ₈	Wheat straw (70%) +Paddy straw (30%)	21.00	21.00	21.00
T ₉	Wheat straw (65%) +Paddy straw (35%)	21.33	21.33	21.33
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	21.67	21.67	21.67
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	21.67	22.00	21.83
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	22.00	22.33	22.17
	General mean	20.83	21.03	20.93
	S.Em (\pm)	0.62	0.63	0.40
	C.D. at 5%	1.80	1.84	1.13

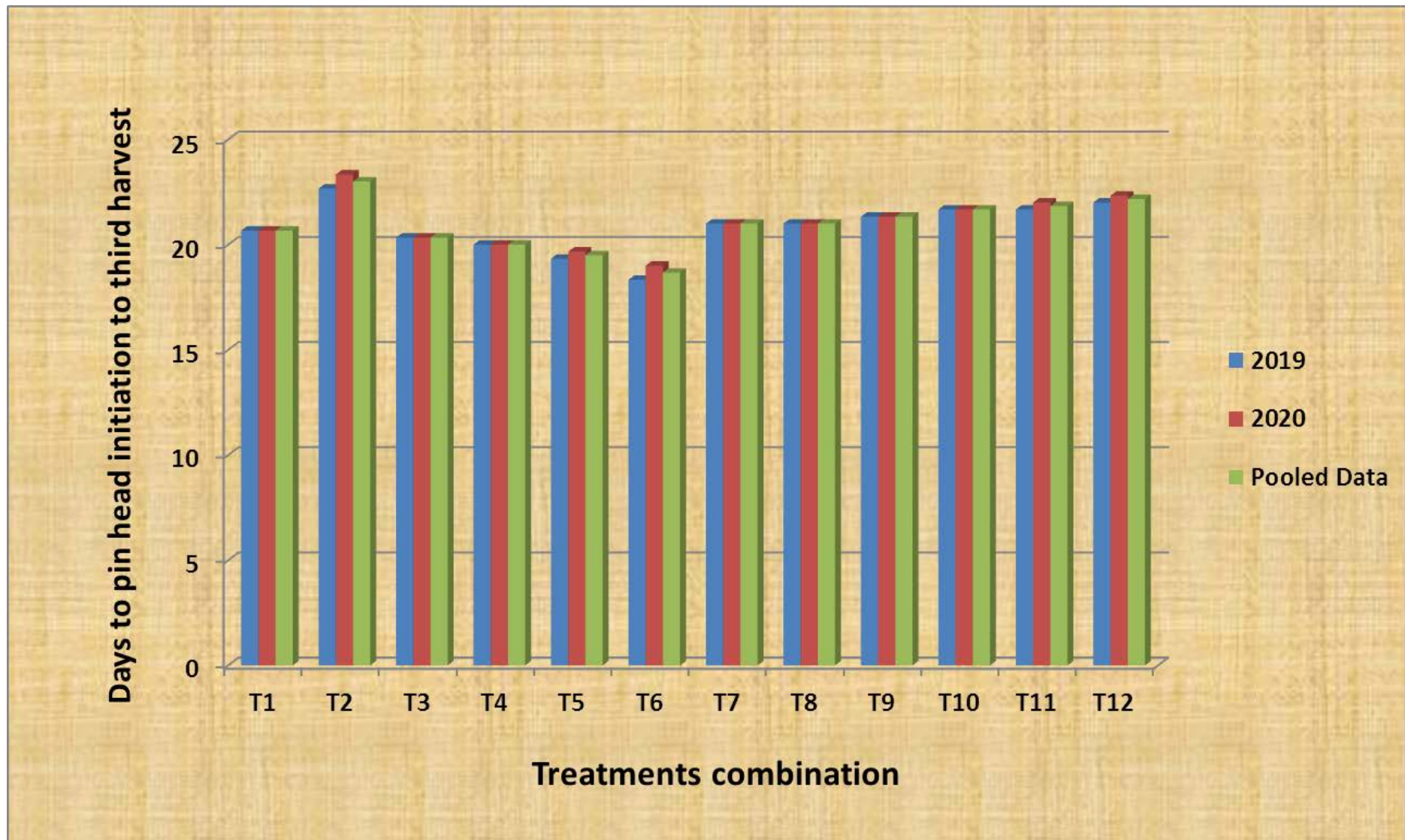


Fig. 4.10: The effect of different treatments combination on days required to pin head initiation to third harvest of Oyster mushroom

(11.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 11.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 12.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 12.33 days) and T₁ (Wheat straw 100%, 12.67 days), whereas maximum days (14.33 days) was taken to days to pin head initiation to first.

Findings based on pooled data revealed that treatment was significantly influenced on days to pin head initiation to second harvest different treatments combination. The minimum days to pin head initiation to second harvest (10.83 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 11.33 days), T₄ (Wheat straw 90% + Paddy straw 10%, 11.83 days), T₃ (Wheat straw 85% + Paddy straw 15%, 12.17 days) and T₁ (Wheat straw 100%, 12.50 days), whereas maximum days (14.00 days) was taken to days to pin head initiation to second harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (11.33 days) and T₄ (11.83 days) treatments.

4.10. Days to pin head initiation to third harvest

The two year of data (2019 and 2020) pertaining to the days to pin head initiation to third harvest along with pooled data have been presented in Table 4.10. and graphically represented in Fig. 4.10.

During the first year of the investigation, the results showed that days to pin head initiation to third harvest was significantly influenced with different treatments combination. The minimum days to pin head initiation to third harvest (18.33 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 19.33 days), T₄ (Wheat straw 90% + Paddy straw 10%, 20.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 20.33 days) and T₁ (Wheat straw 100%, 20.67 days), whereas maximum days (22.67 days) was taken to days to pin head initiation to third harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (19.33 days) and T₄ (20.00 days) treatments.

During the second year of the investigation, the results showed that days to pin head initiation to third harvest was significantly influenced with different

Table- 4.11: The effect of different treatments combination on number of sporophore of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	92.33	91.33	91.83
T ₂	Paddy straw (100%)	85.00	85.00	85.00
T ₃	Wheat straw (95%) +Paddy straw (5%)	93.00	92.67	92.83
T ₄	Wheat straw (90%) +Paddy straw (10%)	94.33	93.67	94.00
T ₅	Wheat straw (85%) +Paddy straw (15%)	96.33	94.33	95.33
T ₆	Wheat straw (80%) +Paddy straw (20%)	97.33	97.00	97.17
T ₇	Wheat straw (75%) +Paddy straw (25%)	92.00	90.33	91.17
T ₈	Wheat straw (70%) +Paddy straw (30%)	91.33	89.33	90.33
T ₉	Wheat straw (65%) +Paddy straw (35%)	89.33	88.33	88.83
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	88.00	86.33	87.17
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	87.00	85.67	86.33
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	86.33	85.33	85.83
	General mean	91.03	89.94	90.49
	S.Em (±)	1.54	2.28	1.26
	C.D. at 5%	4.49	6.66	3.57

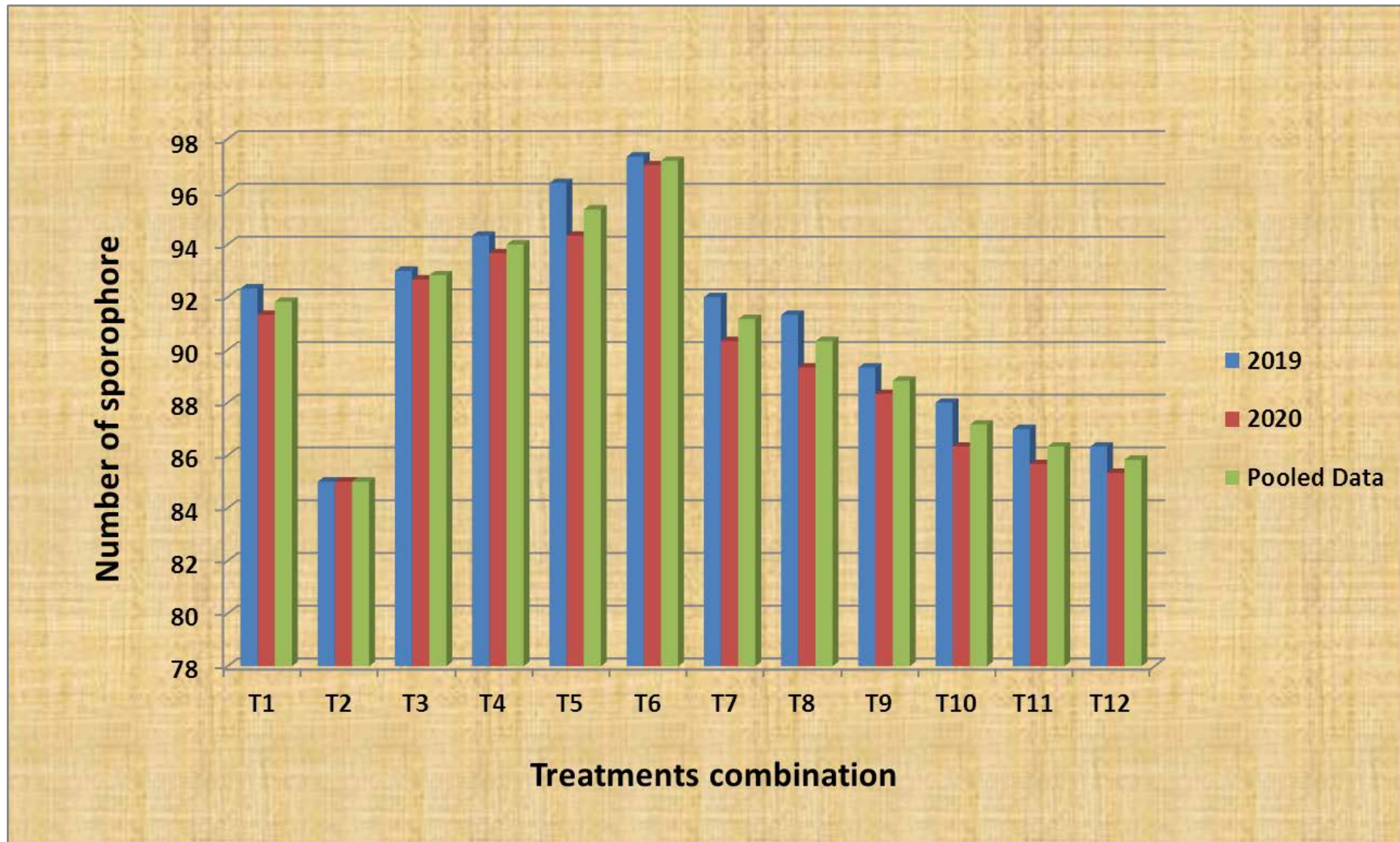


Fig. 4.11: The effect of different treatments combination on number of sporophore of Oyster mushroom

treatments combination. The minimum days to pin head initiation to third harvest (19.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 19.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 20.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 20.33 days) and T₁ (Wheat straw 100%, 20.67 days), whereas maximum days (23.33 days) was taken to days to pin head initiation to third harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (19.67 days), T₄ (20.00 days), T₃ (20.33 days) and T₁ (20.67 days) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on days to pin head initiation to third harvest different treatments combination. The minimum days to pin head initiation to third harvest (18.67 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 19.50 days), T₄ (Wheat straw 90% + Paddy straw 10%, 20.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 20.33 days) and T₁ (Wheat straw 100%, 20.67 days), whereas maximum days (23.00 days) was taken to days to pin head initiation to third harvest was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (19.50 days) treatments.

4.11. Number of sporophore

The two year of data (2019 and 2020) pertaining to the number of sporophore along with pooled data have been presented in Table 4.11. and graphically depicted in Fig. 4.11.

During the first year of the investigation, the results showed that the number of sporophore was significantly influenced with different treatments combination. The maximum number of sporophore (97.33) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 96.33), T₄ (Wheat straw 90% + Paddy straw 10%, 94.33), T₃ (Wheat straw 85% + Paddy straw 15%, 93.00), T₁ (Wheat straw 100%, 92.33) and T₇ (Wheat straw 75% + Paddy straw 25%, 92.00). The minimum number of sporophore was recorded in treatment T₂ (Paddy straw 100%, 85.00). The general mean for this character was (91.03).

Table- 4.12: The effect of different treatments combination on weight of sporophore per bunch (g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	37.53	37.83	37.68
T ₂	Paddy straw (100%)	30.23	30.90	30.57
T ₃	Wheat straw (95%) +Paddy straw (5%)	39.00	40.60	39.80
T ₄	Wheat straw (90%) +Paddy straw (10%)	40.40	42.13	41.27
T ₅	Wheat straw (85%) +Paddy straw (15%)	41.10	42.30	41.70
T ₆	Wheat straw (80%) +Paddy straw (20%)	41.27	42.53	41.90
T ₇	Wheat straw (75%) +Paddy straw (25%)	36.17	38.10	37.13
T ₈	Wheat straw (70%) +Paddy straw (30%)	36.10	37.57	36.83
T ₉	Wheat straw (65%) +Paddy straw (35%)	35.17	36.23	35.70
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	34.90	35.07	34.98
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	33.90	34.47	34.18
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	32.57	33.57	33.07
	General mean	36.53	37.61	37.07
	S.Em (±)	0.56	0.39	0.41
	C.D. at 5%	1.64	1.99	1.15

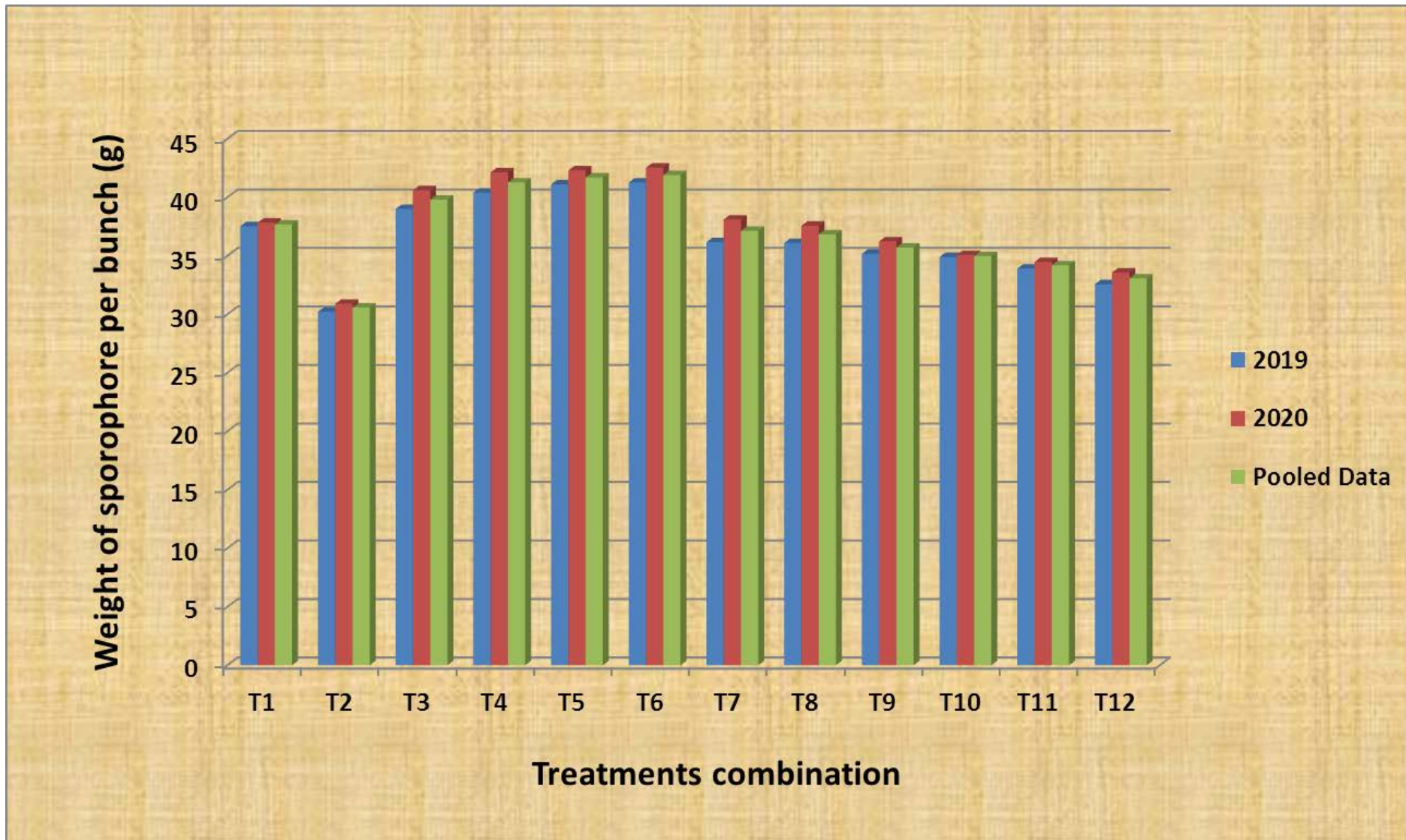


Fig. 4.12: The effect of different treatments combination on weight of sporophore per bunch (g) of Oyster mushroom

The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (96.33), T₄ (94.33) and T₃ (93.00) treatments. During the second year of the investigation, the results showed that the number of sporophore was significantly influenced with different treatments combination. The maximum number of sporophore (97.00) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 94.33), T₄ (Wheat straw 90% + Paddy straw 10%, 93.67), T₃ (Wheat straw 85% + Paddy straw 15%, 92.67), T₁ (Wheat straw 100%, 91.33) and T₇ (Wheat straw 75% + Paddy straw 25%, 90.33). The minimum number of sporophore was recorded in treatment T₂ (Paddy straw 100%, 85.00). The general mean for this character was (89.94). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (94.33), T₄ (93.67), T₃ (92.67) and T₁ (91.33) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on number of sporophore different treatments combination. The maximum number of sporophore (97.17) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 95.33), T₄ (Wheat straw 90% + Paddy straw 10%, 94.00), T₃ (Wheat straw 85% + Paddy straw 15%, 92.83), T₁ (Wheat straw 100%, 91.83) and T₇ (Wheat straw 75% + Paddy straw 25%, 91.17). The minimum number of sporophore was recorded in treatment T₂ (Paddy straw 100%, 85.00). The general mean for this character was (91.03). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (95.33), T₄ (94.00), T₃ (92.83) and T₁ (91.83) treatments.

4.12. Weight of sporophore per bunch (g)

The two year of data (2019 and 2020) pertaining to the weight of sporophore per bunch (g) along with pooled data have been presented in Table 4.12. and graphically represented in Fig. 4.12.

During the first year of the investigation, the results showed that the weight of sporophore per bunch was significantly influenced with different treatments combination. The maximum weight of sporophore per bunch (41.27 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 41.10 g), T₄ (Wheat straw 90% + Paddy straw 10%, 40.40 g), T₃ (Wheat straw 85% + Paddy straw 15%, 39.00 g) and T₁ (Wheat straw

Table- 4.13 : The effect of different treatments combination on number of pinhead of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	161.67	164.00	162.83
T ₂	Paddy straw (100%)	154.00	154.33	154.17
T ₃	Wheat straw (95%) +Paddy straw (5%)	163.33	165.33	164.33
T ₄	Wheat straw (90%) +Paddy straw (10%)	164.67	166.00	165.33
T ₅	Wheat straw (85%) +Paddy straw (15%)	165.00	168.67	166.83
T ₆	Wheat straw (80%) +Paddy straw (20%)	168.67	170.33	169.50
T ₇	Wheat straw (75%) +Paddy straw (25%)	160.00	162.67	161.33
T ₈	Wheat straw (70%) +Paddy straw (30%)	157.33	161.33	159.33
T ₉	Wheat straw (65%) +Paddy straw (35%)	156.00	160.33	158.17
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	155.67	158.67	157.17
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	155.00	158.00	156.50
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	154.33	155.00	154.67
	General mean	159.64	162.05	160.85
	S.Em (±)	1.46	1.91	1.74
	C.D. at 5%	4.25	5.56	3.48

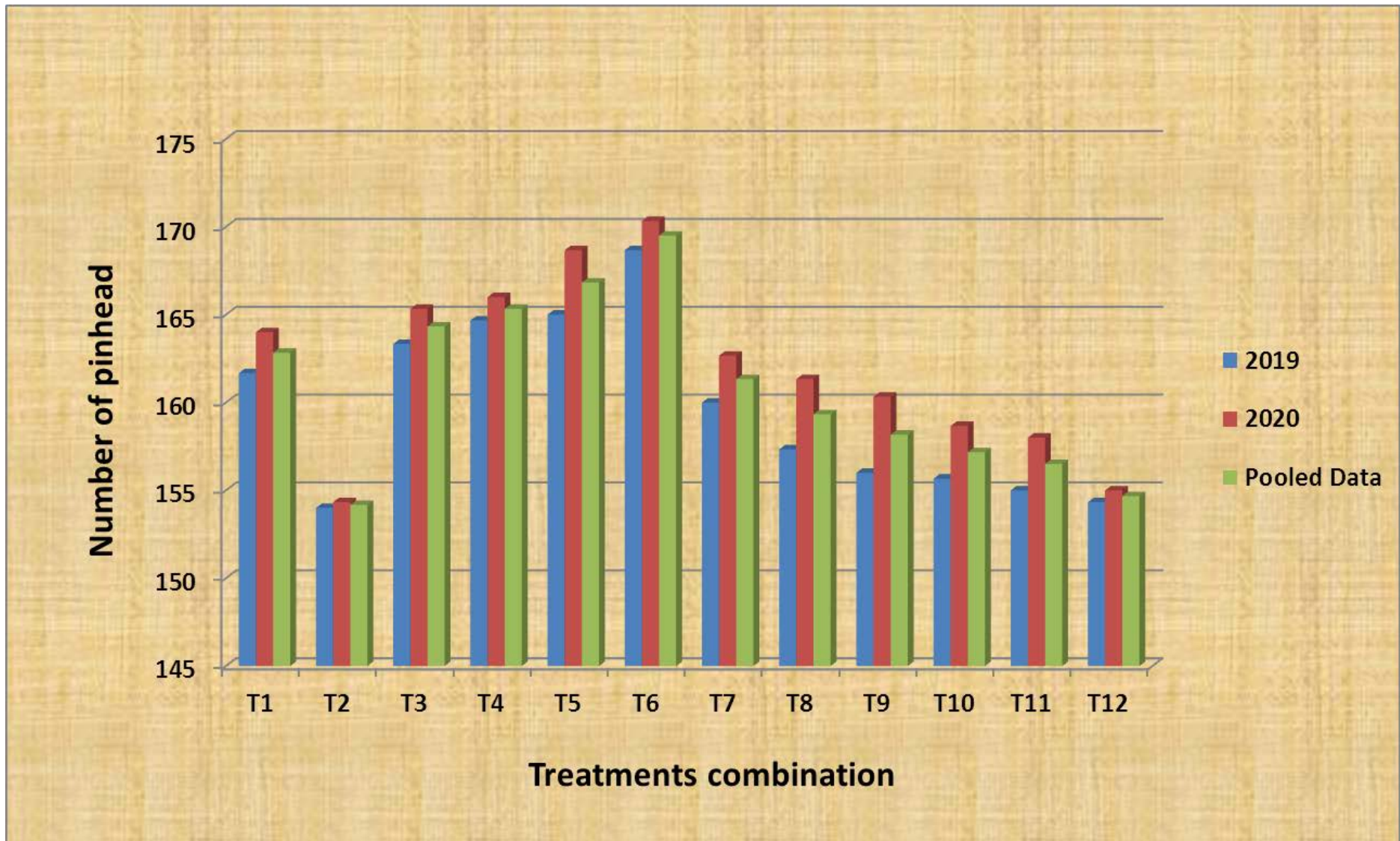


Fig.- 4.13 : The effect of different treatments combination on number of pinhead of Oyster mushroom

100%, 37.53 g). The minimum weight of sporophore per bunch was recorded in treatment T₂ (Paddy straw 100%, 30.23 g). The general mean for this character was 36.53 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (41.27 g) and T₄ (40.40 g) treatments.

During the second year of the investigation, the results showed that the weight of sporophore per bunch was significantly influenced with different treatments combination. The maximum weight of sporophore per bunch (42.53 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 42.30 g), T₄ (Wheat straw 90% + Paddy straw 10%, 42.13 g), T₃ (Wheat straw 85% + Paddy straw 15%, 40.60 g) and T₁ (Wheat straw 100%, 37.83 g). The minimum weight of sporophore per bunch was recorded in treatment T₂ (Paddy straw 100%, 30.90 g). The general mean for this character was 37.61 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (42.30 g) and T₄ (42.13 g) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on weight of sporophore per bunch different treatments combination. The maximum weight of sporophore per bunch (41.90 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 41.70 g), T₄ (Wheat straw 90% + Paddy straw 10%, 41.27 g), T₃ (Wheat straw 85% + Paddy straw 15%, 40.60 g) and T₁ (Wheat straw 100%, 37.68 g). The minimum weight of sporophore per bunch was recorded in treatment T₂ (Paddy straw 100%, 30.57 g). The general mean for this character was 37.07 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (41.70 g) and T₄ (41.27 g) treatments.

4.13. Number of pinhead

The two year of data (2019 and 2020) pertaining to the number of pinhead along with pooled data have been presented in Table 4.13. and graphically represented in Fig. 4.13.

During the first year of the investigation, the results showed that the number of pinhead was significantly influenced with different treatments combination. The maximum number of pinhead (168.67) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%,

Table- 4.14: The effect of different treatments combination on number of fruiting bodies of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	26.67	29.67	28.17
T ₂	Paddy straw (100%)	23.67	24.33	24.00
T ₃	Wheat straw (95%) +Paddy straw (5%)	27.33	31.33	29.33
T ₄	Wheat straw (90%) +Paddy straw (10%)	28.67	32.00	30.33
T ₅	Wheat straw (85%) +Paddy straw (15%)	29.67	33.67	31.67
T ₆	Wheat straw (80%) +Paddy straw (20%)	30.33	34.00	32.17
T ₇	Wheat straw (75%) +Paddy straw (25%)	26.33	28.67	27.50
T ₈	Wheat straw (70%) +Paddy straw (30%)	26.00	27.00	26.50
T ₉	Wheat straw (65%) +Paddy straw (35%)	25.33	27.00	26.17
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	25.00	26.67	25.83
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	24.67	25.33	25.00
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	24.00	25.00	24.50
	General mean	26.47	28.72	27.60
	S.Em (\pm)	0.71	0.86	0.76
	C.D. at 5%	2.06	2.50	2.15

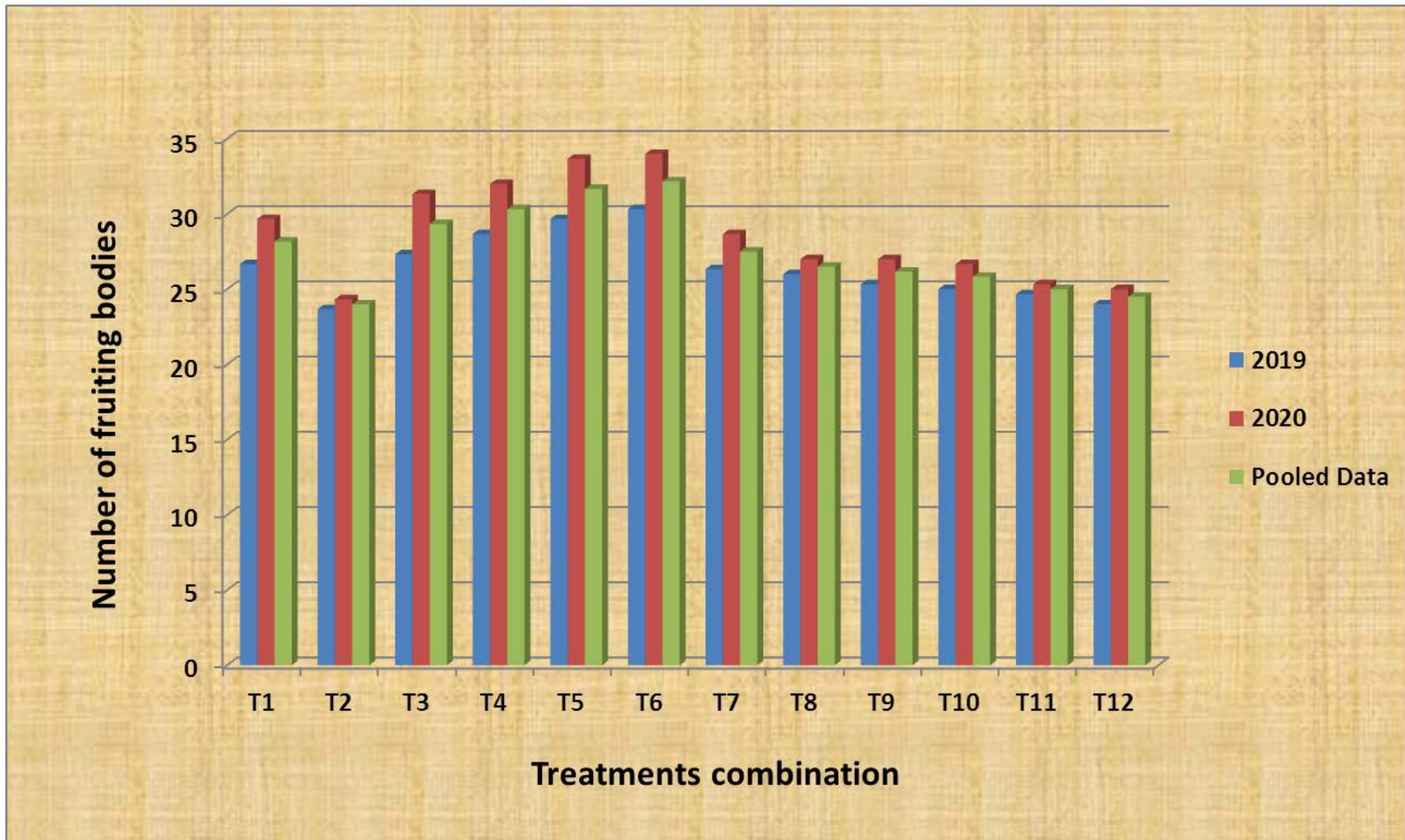


Fig. 4.14: The effect of different treatments combination on number of fruiting bodies of Oyster mushroom

165.00), T₄ (Wheat straw 90% + Paddy straw 10%, 164.67), T₃ (Wheat straw 85% + Paddy straw 15%, 163.33) and T₁ (Wheat straw 100%, 161.67). The minimum number of pinhead was recorded in treatment T₂ (Paddy straw 100%, 154.00). The general mean for this character was (159.64). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (165.00), T₄ (164.67) and T₃ (163.33) treatments.

During the second year of the investigation, the results showed that the number of pinhead was significantly influenced with different treatments combination. The maximum number of pinhead (170.33) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 168.67), T₄ (Wheat straw 90% + Paddy straw 10%, 166.00), T₃ (Wheat straw 85% + Paddy straw 15%, 165.33) and T₁ (Wheat straw 100%, 164.00). The minimum number of pinhead was recorded in treatment T₂ (Paddy straw 100%, 154.33). The general mean for this character was (162.05). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (168.67), T₄ (166.00) and T₃ (165.33) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on number of pinhead different treatments combination. The maximum number of pinhead (169.50) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 166.83), T₄ (Wheat straw 90% + Paddy straw 10%, 165.33), T₃ (Wheat straw 85% + Paddy straw 15%, 164.33) and T₁ (Wheat straw 100%, 162.83). The minimum number of pinhead was recorded in treatment T₂ (Paddy straw 100%, 154.17). The general mean for this character was (162.85). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (166.83), T₄ (165.83) and T₃ (164.33) treatments.

4.14. Number of effective fruiting bodies

The two year of data (2019 and 2020) pertaining to the number of effective fruiting bodies along with pooled data have been presented in Table 4.14. and graphically represented in Fig. 4.14.

During the first year of the investigation, the results showed that the number of effective fruiting bodies was significantly influenced with different treatments combination.

Table- 4.15 The effect of different treatments combination on number of primordia of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	166.00	168.00	167.00
T ₂	Paddy straw (100%)	156.67	157.56	157.11
T ₃	Wheat straw (95%) +Paddy straw (5%)	168.00	169.33	168.67
T ₄	Wheat straw (90%) +Paddy straw (10%)	170.00	169.00	169.50
T ₅	Wheat straw (85%) +Paddy straw (15%)	171.33	172.11	171.72
T ₆	Wheat straw (80%) +Paddy straw (20%)	174.00	174.00	174.00
T ₇	Wheat straw (75%) +Paddy straw (25%)	165.33	165.78	165.56
T ₈	Wheat straw (70%) +Paddy straw (30%)	164.33	163.78	164.06
T ₉	Wheat straw (65%) +Paddy straw (35%)	163.33	164.44	163.89
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	161.67	162.22	161.94
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	160.00	161.00	160.50
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	159.67	159.56	159.61
	General mean	165.03	165.56	165.30
	S.Em (\pm)	2.21	1.69	1.31
	C.D. at 5%	6.44	4.93	3.72

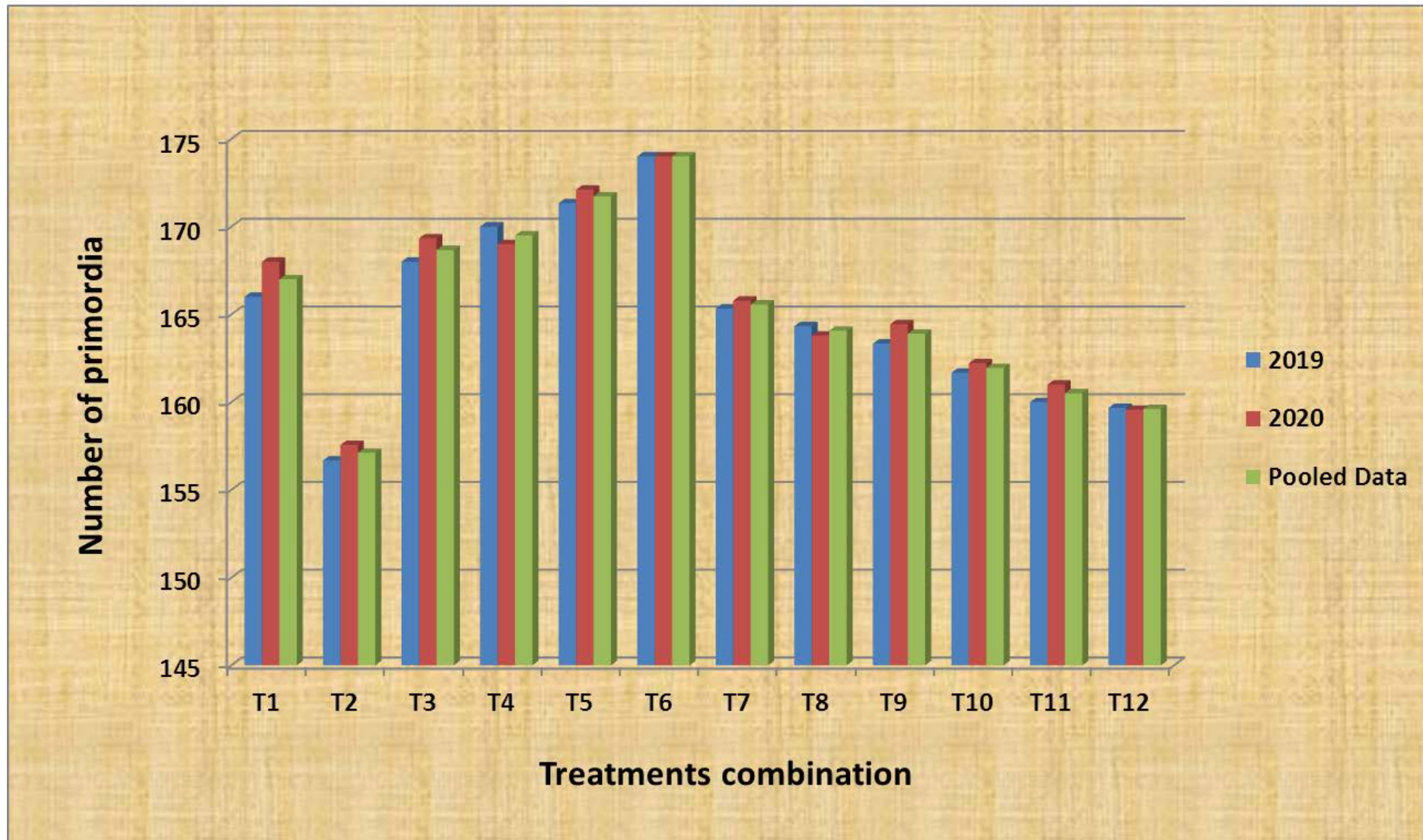


Fig. 4.15: The effect of different treatments combination on number of primordia of Oyster mushroom

The maximum number of effective fruiting bodies (30.33) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 29.67), T₄ (Wheat straw 90% + Paddy straw 10%, 28.67), T₃ (Wheat straw 85% + Paddy straw 15%, 27.33) and T₁ (Wheat straw 100%, 26.67). The minimum number of effective fruiting bodies was recorded in treatment T₂ (Paddy straw 100%, 23.67). The general mean for this character was (26.47). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (29.67) and T₄ (28.67) treatments.

During the second year of the investigation, the results showed that the number of effective fruiting bodies was significantly influenced with different treatments combination. The maximum number of effective fruiting bodies (34.00) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 33.67), T₄ (Wheat straw 90% + Paddy straw 10%, 32.00), T₃ (Wheat straw 85% + Paddy straw 15%, 31.33) and T₁ (Wheat straw 100%, 29.67). The minimum number of effective fruiting bodies was recorded in treatment T₂ (Paddy straw 100%, 24.33). The general mean for this character was 28.72. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (33.67) and T₄ (32.00) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on number of effective fruiting bodies different treatments combination. The maximum number of effective fruiting bodies (32.17) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 31.67), T₄ (Wheat straw 90% + Paddy straw 10%, 30.33), T₃ (Wheat straw 85% + Paddy straw 15%, 29.33) and T₁ (Wheat straw 100%, 28.17). The minimum number of effective fruiting bodies was recorded in treatment T₂ (Paddy straw 100%, 24.00). The general mean for this character was 27.60. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (31.67) and T₄ (30.33) treatments.

4.15. Number of primordia

The two year of data (2019 and 2020) pertaining to the number of primordia along with pooled data have been presented in Table 4.15. and graphically represented in Fig. 4.15.

Table- 4.16: The effect of different treatments combination on duration of spawn run days of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	19.33	19.33	19.33
T ₂	Paddy straw (100%)	21.33	21.67	21.50
T ₃	Wheat straw (95%) +Paddy straw (5%)	19.00	19.33	19.17
T ₄	Wheat straw (90%) +Paddy straw (10%)	19.00	19.33	19.17
T ₅	Wheat straw (85%) +Paddy straw (15%)	18.67	19.00	18.83
T ₆	Wheat straw (80%) +Paddy straw (20%)	18.00	18.33	18.17
T ₇	Wheat straw (75%) +Paddy straw (25%)	20.33	20.00	20.17
T ₈	Wheat straw (70%) +Paddy straw (30%)	20.33	20.33	20.33
T ₉	Wheat straw (65%) +Paddy straw (35%)	20.33	20.33	20.33
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	20.67	20.67	20.67
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	20.67	20.67	20.67
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	21.00	21.33	21.17
	General mean	19.89	20.03	19.96
	S.Em (\pm)	0.54	0.56	0.35
	C.D. at 5%	1.61	1.64	1.00

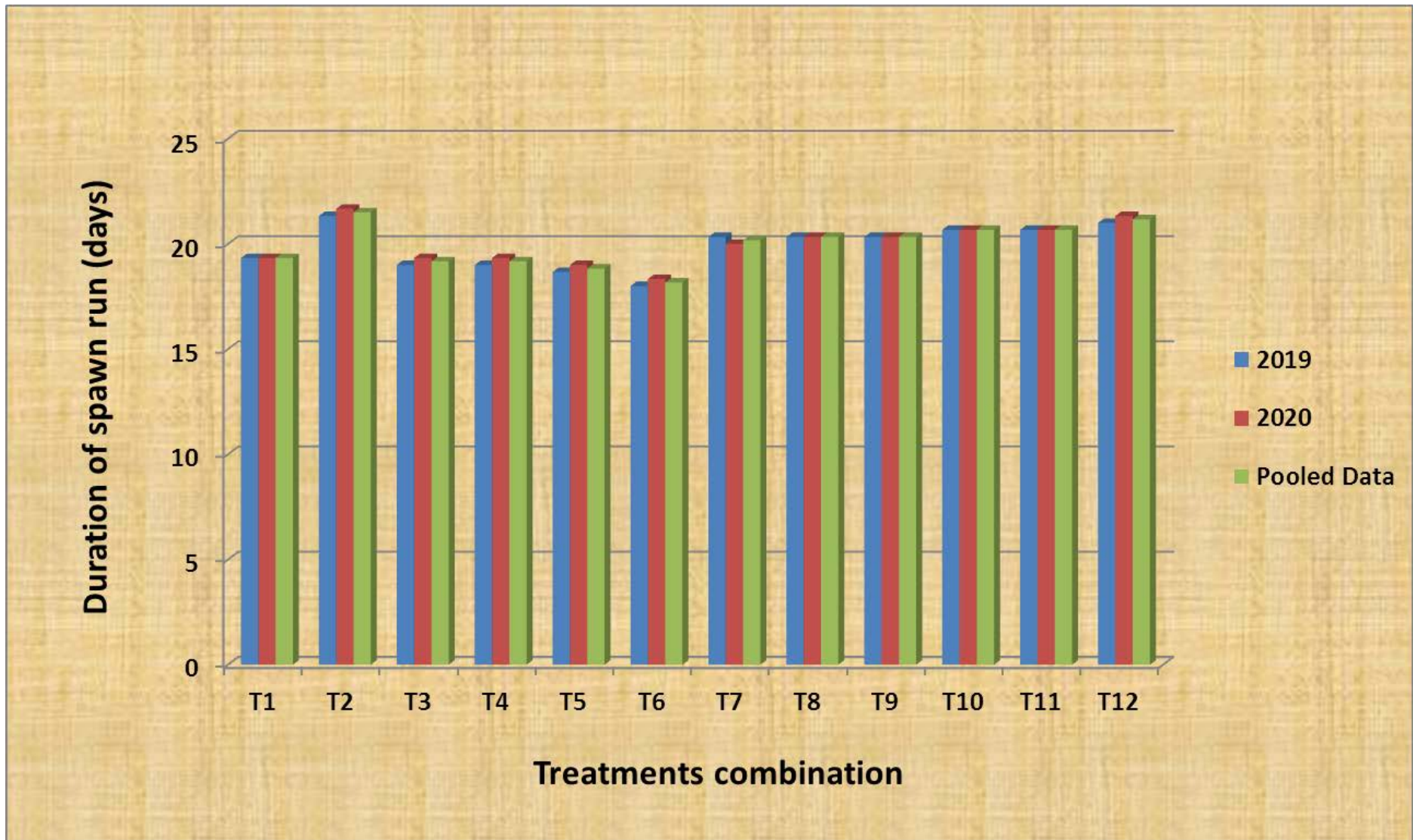


Fig. 4.16: The effect of different treatments combination on duration of spawn run days of Oyster mushroom

During the first year of the investigation, the results showed that the number of primordia was significantly influenced with different treatments combination. The maximum number of primordia (174.00) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 171.33), T₄ (Wheat straw 90% + Paddy straw 10%, 170.00), T₃ (Wheat straw 85% + Paddy straw 15%, 168.00) and T₁ (Wheat straw 100%, 166.00). The minimum number of primordia was recorded in treatment T₂ (Paddy straw 100%, 156.67). The general mean for this character was (165.03). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (171.33), T₄ (170.00) and T₃ (168.00) treatments.

During the second year of the investigation, the results showed that the number of primordia was significantly influenced with different treatments combination. The maximum number of primordia (174.00) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 172.11), T₃ (Wheat straw 85% + Paddy straw 15%, 169.33), T₄ (Wheat straw 90% + Paddy straw 10%, 169.00) and T₁ (Wheat straw 100%, 168.00). The minimum number of primordia was recorded in treatment T₂ (Paddy straw 100%, 157.56). The general mean for this character was (165.56). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (172.11), T₃ (169.33) and T₄ (169.00) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on number of primordia different treatments combination. The maximum number of primordia (174.00) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 171.72), T₃ (Wheat straw 85% + Paddy straw 15%, 169.50), T₄ (Wheat straw 90% + Paddy straw 10%, 168.67) and T₁ (Wheat straw 100%, 167.00). The minimum number of primordia was recorded in treatment T₂ (Paddy straw 100%, 157.11). The general mean for this character was (165.30). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (171.72), T₃ (169.50) and T₄ (168.67) treatments.

Table- 4.17: The effect of different treatments combination on yield of first harvest per bed (g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	383.77	383.87	383.82
T ₂	Paddy straw (100%)	352.07	351.90	351.98
T ₃	Wheat straw (95%) +Paddy straw (5%)	393.43	391.80	392.62
T ₄	Wheat straw (90%) +Paddy straw (10%)	398.67	396.17	397.42
T ₅	Wheat straw (85%) +Paddy straw (15%)	400.13	397.13	398.63
T ₆	Wheat straw (80%) +Paddy straw (20%)	402.13	398.53	400.33
T ₇	Wheat straw (75%) +Paddy straw (25%)	381.40	384.57	382.98
T ₈	Wheat straw (70%) +Paddy straw (30%)	375.33	368.63	371.98
T ₉	Wheat straw (65%) +Paddy straw (35%)	373.07	356.53	364.80
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	365.27	348.63	356.95
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	357.33	354.17	355.75
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	354.13	352.17	353.15
	General mean	378.06	373.68	375.87
	S.Em (\pm)	5.60	3.87	3.46
	C.D. at 5%	16.35	11.31	9.79

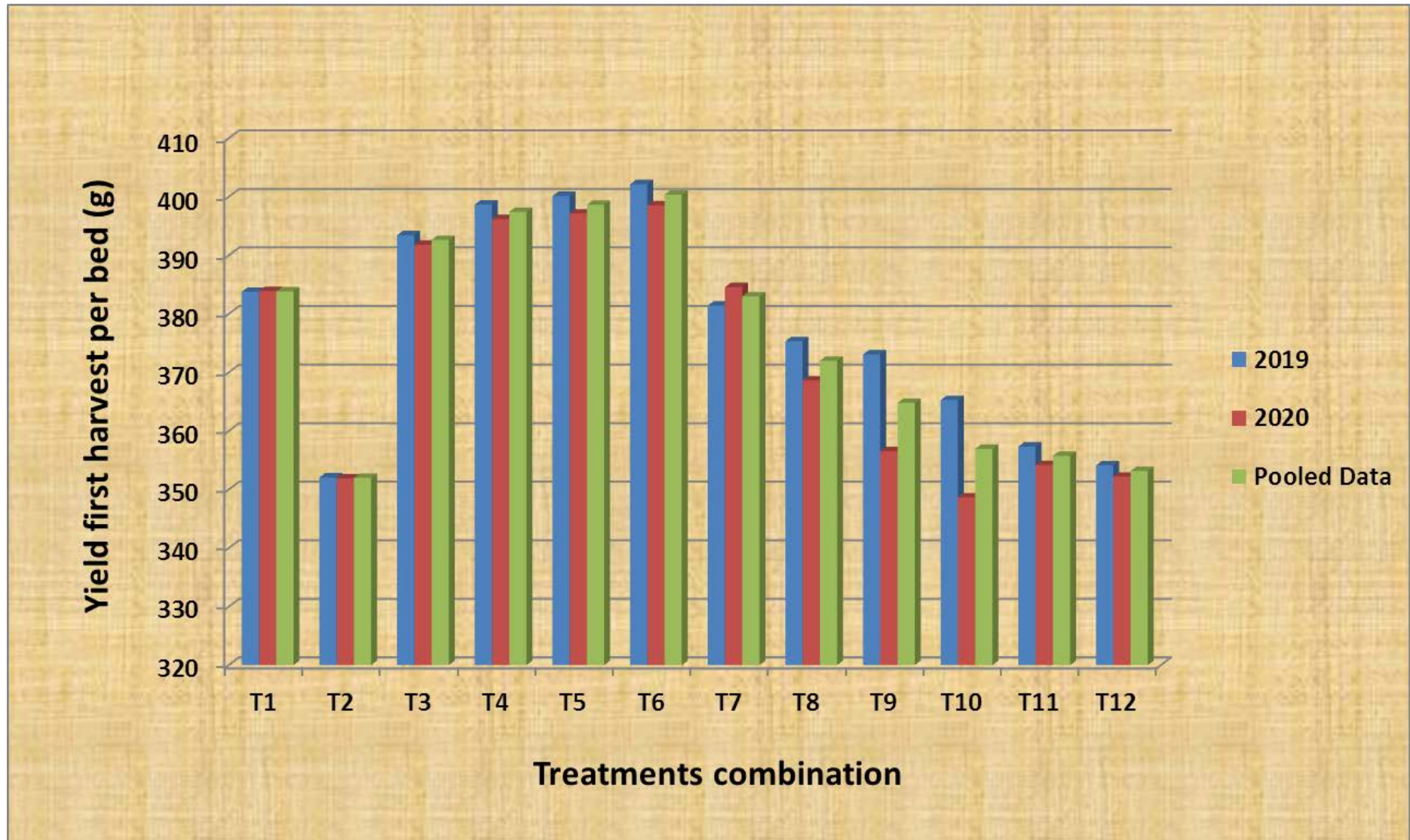


Fig. 4.17: The effect of different treatments combination on yield of first harvest per bed of Oyster mushroom

4.16. Substrate spawn run (days)

The two year of data (2019 and 2020) pertaining to the days to substrate spawn run along with pooled data have been presented in Table 4.16. and graphically represented in Fig. 4.16.

During the first year of the investigation, the results showed that days to substrate spawn run was significantly influenced with different treatments combination. The minimum days to substrate spawn run (18.00 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 18.67 days), T₄ (Wheat straw 90% + Paddy straw 10%, 19.00 days), T₃ (Wheat straw 85% + Paddy straw 15%, 19.00 days) and T₁ (Wheat straw 100%, 19.33 days), whereas maximum days (21.33 days) was taken to days to substrate spawn run was recorded in treatment T₂ (Paddy straw 100%). The general mean for this character was 19.89 days. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (18.67 days), T₄ (19.00 days), T₃ (19.00 days) and T₁ (19.33 days) treatments.

During the second year of the investigation, the results showed that days to substrate spawn run was significantly influenced with different treatments combination. The minimum days to substrate spawn run (18.33 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 19.00 days), T₄ (Wheat straw 90% + Paddy straw 10%, 19.33 days), T₃ (Wheat straw 85% + Paddy straw 15%, 19.33 days) and T₁ (Wheat straw 100%, 19.33 days), whereas maximum days (21.67 days) was taken to days to substrate spawn run was recorded in treatment T₂ (Paddy straw 100%). The general mean for this character was 20.03 days. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (19.00 days), T₄ (19.33 days), T₃ (19.33 days) and T₁ (19.33 days) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on days to substrate spawn run with different treatments combination.

Table- 4.18: The effect of different treatments combination on yield of second harvest per bed (g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	352.00	341.67	346.83
T ₂	Paddy straw (100%)	320.33	318.33	319.33
T ₃	Wheat straw (95%) +Paddy straw (5%)	354.67	343.33	349.00
T ₄	Wheat straw (90%) +Paddy straw (10%)	358.67	345.33	352.00
T ₅	Wheat straw (85%) +Paddy straw (15%)	363.00	347.33	355.17
T ₆	Wheat straw (80%) +Paddy straw (20%)	370.33	350.00	360.17
T ₇	Wheat straw (75%) +Paddy straw (25%)	349.33	339.67	344.50
T ₈	Wheat straw (70%) +Paddy straw (30%)	345.33	337.00	341.17
T ₉	Wheat straw (65%) +Paddy straw (35%)	338.00	331.33	334.67
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	334.67	326.33	330.50
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	332.00	324.33	328.17
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	325.33	319.33	322.33
	General mean	345.31	335.33	340.32
	S.Em (\pm)	4.27	3.58	3.50
	C.D. at 5%	12.46	10.45	9.90

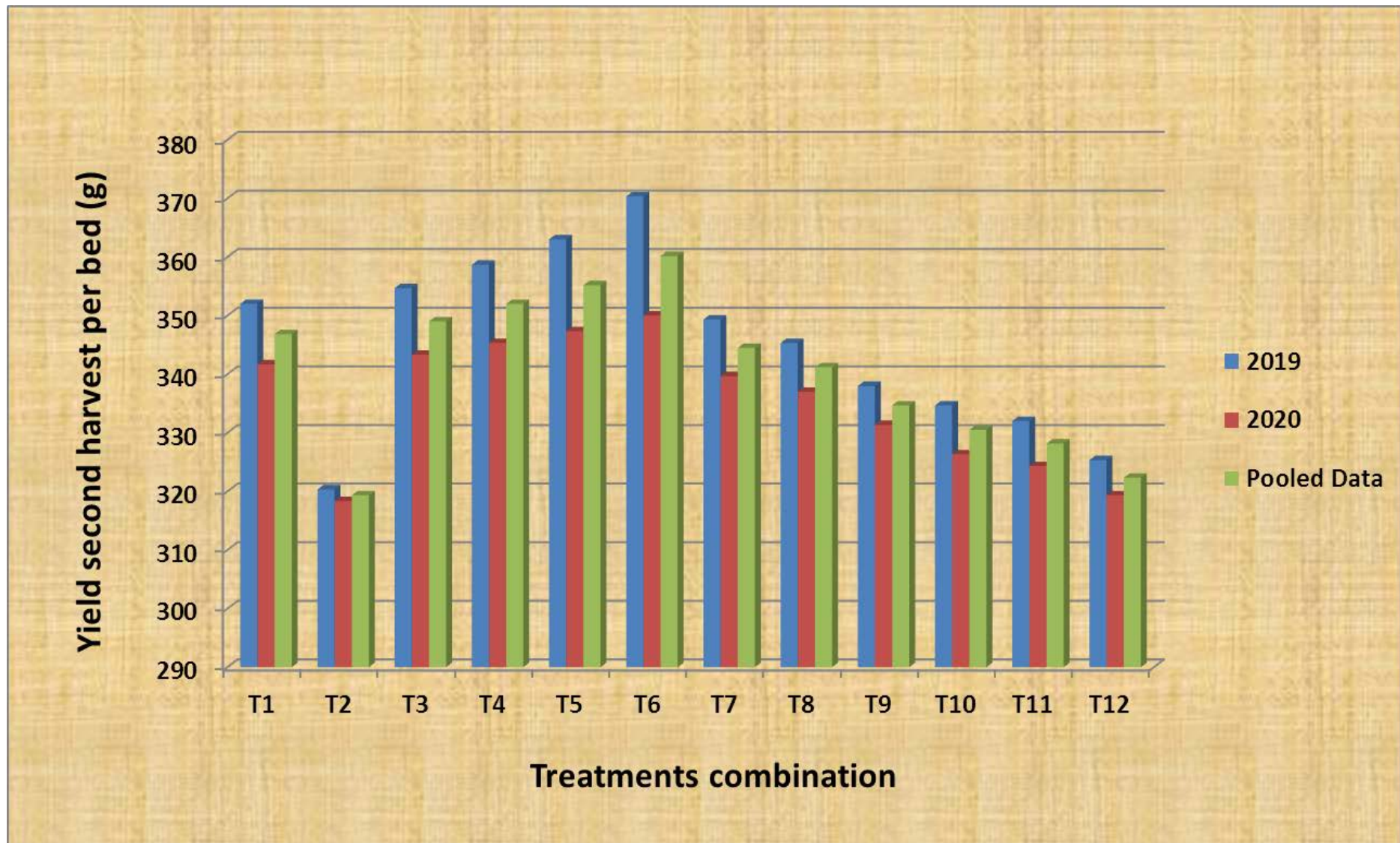


Fig. 4.18: The effect of different treatments combination on yield of second harvest per bed of Oyster mushroom

The minimum days to substrate spawn run (18.17 days) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 18.83 days), T₄ (Wheat straw 90% + Paddy straw 10%, 19.17 days), T₃ (Wheat straw 85% + Paddy straw 15%, 19.17 days) and T₁ (Wheat straw 100%, 19.33 days), whereas maximum days (21.50 days) was taken to days to substrate spawn run was recorded in treatment T₂ (Paddy straw 100%). The general mean for this character was 19.96 days. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (18.83 days), T₄ (19.17 days), T₃ (19.17 days) and T₁ (19.33 days) treatments.

4.17. Yield of first harvest per bed (g)

The two year of data (2019 and 2020) pertaining to the yield of first harvest per bed (g) along with pooled data have been presented in Table 4.17. and graphically depicted in Fig. 4.17.

During the first year of the investigation, the results showed that the yield of first harvest per bed was significantly influenced with different treatments combination. The maximum yield of first harvest per bed (402.13 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 400.13 g), T₄ (Wheat straw 90% + Paddy straw 10%, 398.67 g), T₃ (Wheat straw 85% + Paddy straw 15%, 393.43 g) and T₁ (Wheat straw 100%, 383.77 g). The minimum yield of first harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 352.07 g). The general mean for this character was 378.06 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (400.13 g), T₄ (398.67 g) and T₃ (393.43 g) treatments.

During the second year of the investigation, the results showed that the yield of first harvest per bed was significantly influenced with different treatments combination. The maximum yield of first harvest per bed (398.53 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 397.13 g), T₄ (Wheat straw 90% + Paddy straw 10%, 396.17 g), T₃ (Wheat straw 85% + Paddy straw 15%, 391.80 g) and T₁ (Wheat straw 100%, 383.87 g). The minimum yield of first harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 351.90 g).

Table- 4.19: The effect of different treatment on yield of third harvest per bed (g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	136.20	133.10	134.65
T ₂	Paddy straw (100%)	126.23	125.63	125.93
T ₃	Wheat straw (95%) +Paddy straw (5%)	137.13	134.57	135.85
T ₄	Wheat straw (90%) +Paddy straw (10%)	139.07	136.30	137.68
T ₅	Wheat straw (85%) +Paddy straw (15%)	142.13	138.60	140.37
T ₆	Wheat straw (80%) +Paddy straw (20%)	143.17	141.87	142.52
T ₇	Wheat straw (75%) +Paddy straw (25%)	135.73	132.50	134.12
T ₈	Wheat straw (70%) +Paddy straw (30%)	133.33	130.83	132.08
T ₉	Wheat straw (65%) +Paddy straw (35%)	133.50	130.23	131.87
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	131.50	128.57	130.03
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	129.70	127.47	128.58
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	127.07	126.57	126.82
	General mean	134.56	132.19	133.38
	S.Em (±)	1.80	2.21	1.40
	C.D. at 5%	5.24	6.46	3.96

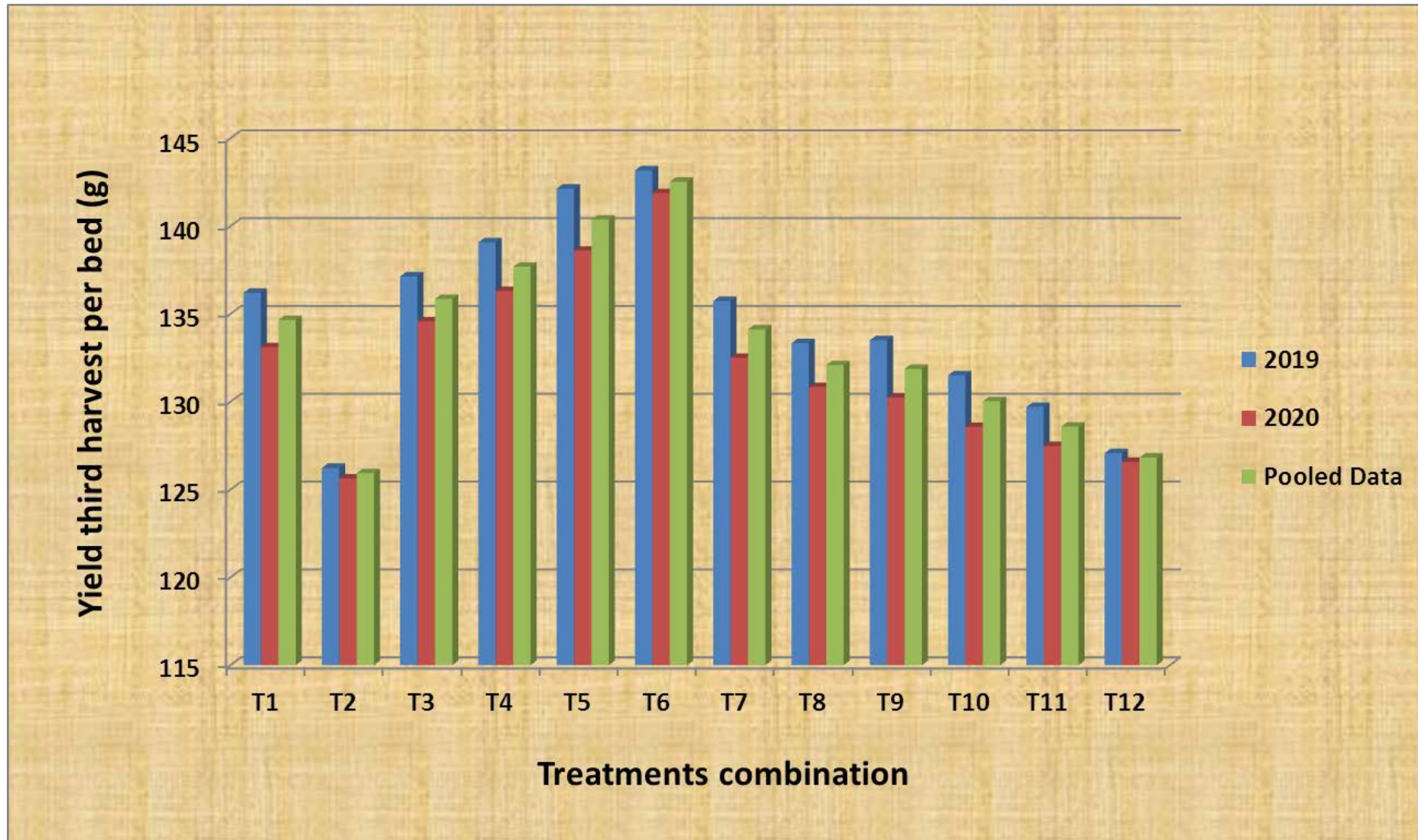


Fig. 4.19: The effect of different treatment on yield of third harvest per bed of Oyster mushroom

The general mean for this character was 372.29 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (397.13 g), T₄ (396.17 g) and T₃ (391.80 g) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the yield of first harvest per bed with different treatments combination. The maximum yield of first harvest per bed (400.33 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 398.63 g), T₄ (Wheat straw 90% + Paddy straw 10%, 397.62 g), T₃ (Wheat straw 85% + Paddy straw 15%, 392.62 g) and T₁ (Wheat straw 100%, 397.42 g). The minimum yield of first harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 383.82 g).

The general mean for this character was 375.87 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (398.63 g), T₄ (397.42 g) and T₃ (392.62 g) treatments.

4.18. Yield of second harvest per bed (g)

The two year of data (2019 and 2020) pertaining to the yield of second harvest per bed (g) along with pooled data have been presented in Table 4.18. and graphically depicted in Fig. 4.18.

During the first year of the investigation, the results showed that the yield of second harvest per bed was significantly influenced with different treatments combination. The maximum yield of second harvest per bed (370.33 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 363.00 g), T₄ (Wheat straw 90% + Paddy straw 10%, 358.67 g), T₃ (Wheat straw 85% + Paddy straw 15%, 354.67 g) and T₁ (Wheat straw 100%, 352.00 g). The minimum yield of second harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 320.33 g). The general mean for this character was 345.31 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (363.00 g) and T₄ (358.67 g) treatments.

Table- 4.20: The effect of different treatments combination on total yield (g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw(100%)	871.67	842.00	856.83
T ₂	Paddy straw (100%)	798.33	778.67	788.50
T ₃	Wheat straw (95%) +Paddy straw (5%)	885.00	846.33	865.67
T ₄	Wheat straw (90%) +Paddy straw (10%)	896.33	871.67	884.00
T ₅	Wheat straw (85%) +Paddy straw (15%)	905.00	881.33	893.17
T ₆	Wheat straw (80%) +Paddy straw (20%)	915.33	890.00	902.67
T ₇	Wheat straw (75%) +Paddy straw (25%)	866.33	833.00	849.67
T ₈	Wheat straw (70%) +Paddy straw (30%)	854.00	826.00	840.00
T ₉	Wheat straw (65%) +Paddy straw (35%)	844.33	807.67	826.00
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	831.00	796.33	813.67
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	819.00	805.67	812.33
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	806.33	791.00	798.67
	General mean	857.72	830.81	844.26
	S.Em (±)	7.07	7.30	5.00
	C.D. at 5%	20.85	21.31	14.15

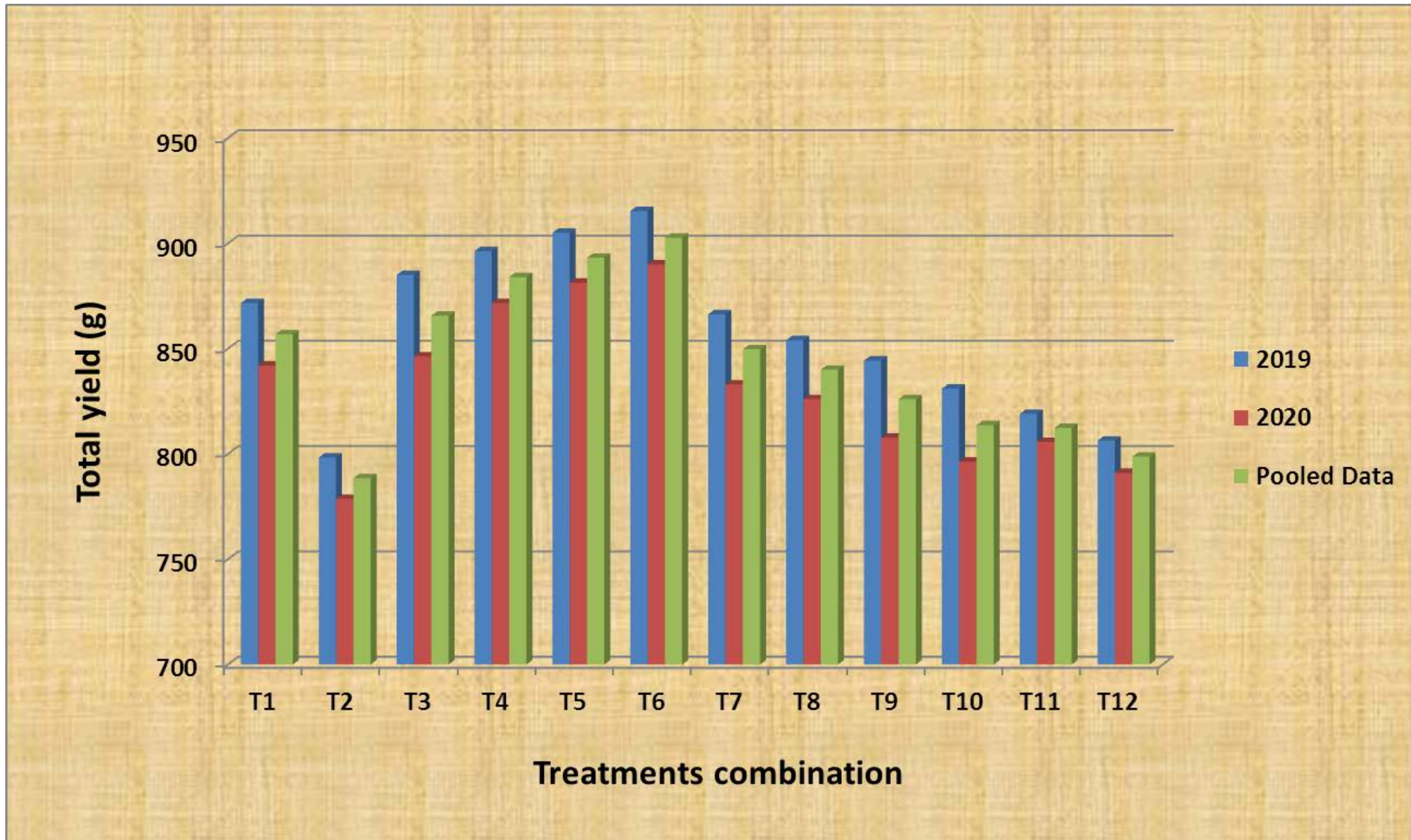


Fig. 4.20: The effect of different treatments combination on total yield (g) of Oyster mushroom

During the second year of the investigation, the results showed that the yield of second harvest per bed was significantly influenced with different treatments combination. The maximum yield of second harvest per bed (350.00 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 347.33 g), T₄ (Wheat straw 90% + Paddy straw 10%, 345.33 g), T₃ (Wheat straw 85% + Paddy straw 15%, 343.33 g) and T₁ (Wheat straw 100%, 341.67 g). The minimum yield of second harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 318.33 g). The general mean for this character was 335.33 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (347.33 g), T₄ (345.33 g), T₃ (343.33 g), T₁ (341.67 g) and T₇ (339.67 g) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the yield of second harvest per bed with different treatments combination. The maximum yield of second harvest per bed (360.17 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 355.17 g), T₄ (Wheat straw 90% + Paddy straw 10%, 352.00 g), T₃ (Wheat straw 85% + Paddy straw 15%, 349.00 g) and T₁ (Wheat straw 100%, 346.83 g). The minimum yield of second harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 319.33 g). The general mean for this character was 340.32 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (355.17 g) and T₄ (352.00 g) treatments.

4.19. Yield of third harvest per bed (g)

The two year of data (2019 and 2020) pertaining to the yield of first harvest per bed (g) along with pooled data have been presented in Table 4.19. and graphically represented in Fig. 4.19.

During the first year of the investigation, the results showed that the yield of third harvest per bed was significantly influenced with different treatments combination.

Table- 4.21: The effect of different treatments combination on biological efficiency of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	88.33	87.00	87.67
T ₂	Paddy straw (100%)	84.33	84.00	84.17
T ₃	Wheat straw (95%) +Paddy straw (5%)	88.67	88.00	88.33
T ₄	Wheat straw (90%) +Paddy straw (10%)	89.00	88.33	88.67
T ₅	Wheat straw (85%) +Paddy straw (15%)	89.67	88.67	89.17
T ₆	Wheat straw (80%) +Paddy straw (20%)	90.00	89.00	89.50
T ₇	Wheat straw (75%) +Paddy straw (25%)	87.00	86.67	86.83
T ₈	Wheat straw (70%) +Paddy straw (30%)	86.00	86.33	86.17
T ₉	Wheat straw (65%) +Paddy straw (35%)	85.33	86.00	85.67
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	85.00	85.67	85.33
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	84.67	85.00	84.83
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	84.33	84.33	84.33
	General mean	86.86	86.11	86.49
	S.Em (\pm)	0.56	0.80	0.46
	C.D. at 5%	1.64	2.33	1.31

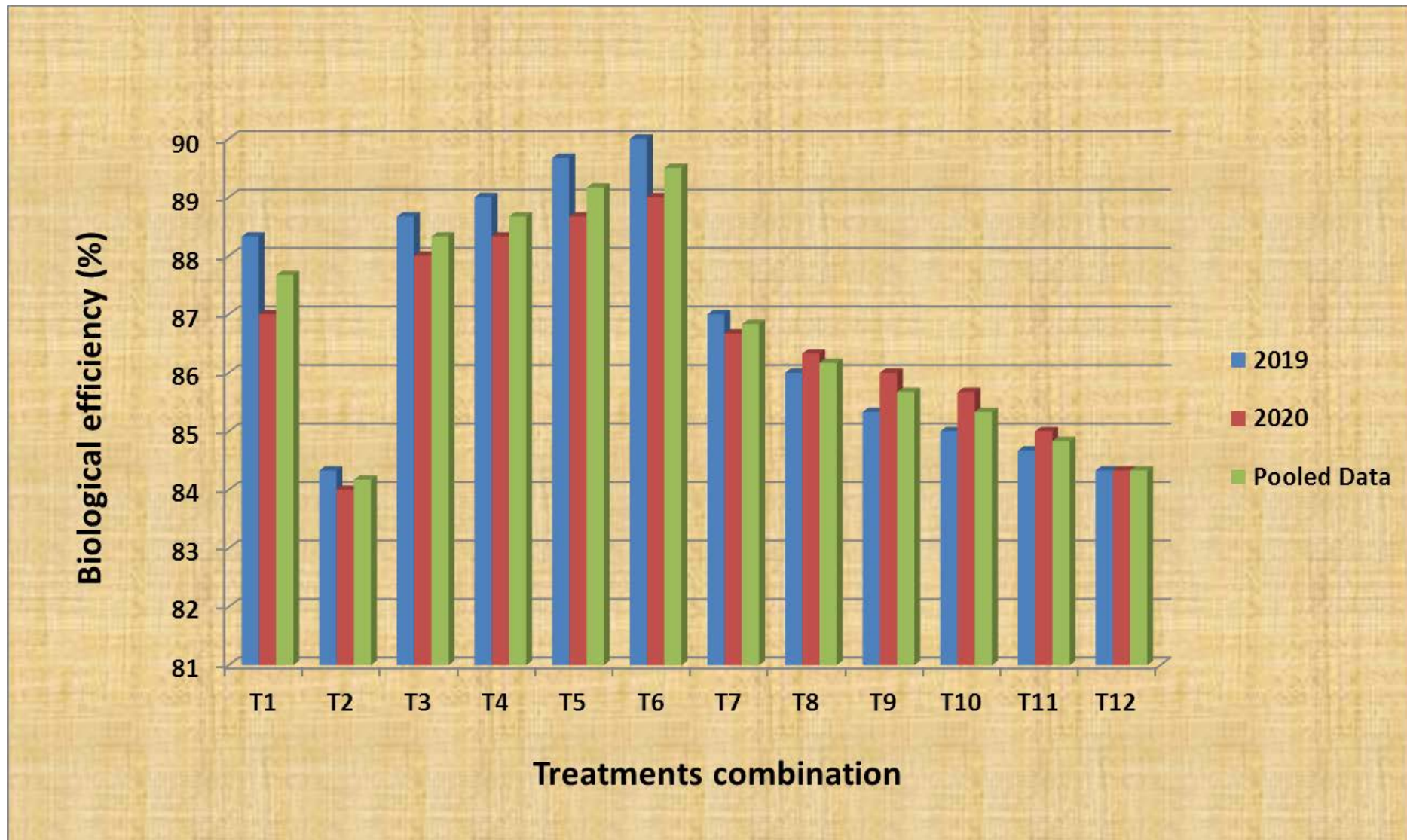


Fig. 4.21: The effect of different treatments combination on biological efficiency of Oyster mushroom

The maximum yield of third harvest per bed (143.17 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 142.13 g), T₄ (Wheat straw 90% + Paddy straw 10%, 139.07 g), T₃ (Wheat straw 85% + Paddy straw 15%, 137.17 g) and T₁ (Wheat straw 100%, 136.20 g). The minimum yield of third harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 126.23 g). The general mean for this character was 134.56 g.

Findings based on pooled data revealed that treatment was significantly influenced on the yield of second harvest per bed with different treatments combination. The maximum yield of second harvest per bed (360.17 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 355.17 g), T₄ (Wheat straw 90% + Paddy straw 10%, 352.00 g), T₃ (Wheat straw 85% + Paddy straw 15%, 349.00 g) and T₁ (Wheat straw 100%, 346.83 g). The minimum yield of second harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 319.33 g). The general mean for this character was 340.32 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (355.17 g) and T₄ (352.00 g) treatments.

4.19. Yield of third harvest per bed (g)

The two year of data (2019 and 2020) pertaining to the yield of first harvest per bed (g) along with pooled data have been presented in Table 4.19. and graphically represented in Fig. 4.19.

During the first year of the investigation, the results showed that the yield of third harvest per bed was significantly influenced with different treatments combination. The maximum yield of third harvest per bed (143.17 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 142.13 g), T₄ (Wheat straw 90% + Paddy straw 10%, 139.07 g), T₃ (Wheat straw 85% + Paddy straw 15%, 137.17 g) and T₁ (Wheat straw 100%, 136.20 g). The minimum yield of third harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 126.23 g). The general mean for this character was 134.56 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (142.13 g) and T₄ (139.07 g) treatments.

During the second year of the investigation, the results showed that the yield of third harvest per bed was significantly influenced with different treatments combination. The maximum yield of third harvest per bed (141.87 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 138.60 g), T₄ (Wheat straw 90% + Paddy straw 10%, 136.30 g), T₃ (Wheat straw 85% + Paddy straw 15%, 134.57 g) and T₁ (Wheat straw 100%, 133.10 g). The minimum yield of third harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 125.63 g). The general mean for this character was 132.19 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (138.60 g) and T₄ (136.30 g) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the yield of third harvest per bed with different treatments combination. The maximum yield of third harvest per bed (142.52 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 140.37 g), T₄ (Wheat straw 90% + Paddy straw 10%, 137.68 g), T₃ (Wheat straw 85% + Paddy straw 15%, 135.85 g) and T₁ (Wheat straw 100%, 134.65 g). The minimum yield of third harvest per bed was recorded in treatment T₂ (Paddy straw 100%, 125.93 g). The general mean for this character was 133.38 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (140.37 g) treatments.

4.20. Total yield (g)

The two year of data (2019 and 2020) pertaining to the total yield (g) along with pooled data have been presented in Table 4.20. and graphically depicted in Fig. 4.20.

During the first year of the investigation, the results showed that the total yield was significantly influenced with different treatments combination. The maximum total yield (915.33 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 905.00 g), T₄ (Wheat straw 90% + Paddy straw 10%, 896.33 g), T₃ (Wheat straw 85% + Paddy straw 15%, 885.00 g) and T₁ (Wheat straw 100%, 871.67 g). The minimum total yield was recorded in treatment T₂ (Paddy straw 100%, 798.33 g).

Table- 4.22: The effect of different treatments combination on moisture content (%) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	85.67	86.67	86.17
T ₂	Paddy straw (100%)	90.00	90.00	90.00
T ₃	Wheat straw (95%) +Paddy straw (5%)	85.33	86.33	85.83
T ₄	Wheat straw (90%) +Paddy straw (10%)	85.33	86.00	85.67
T ₅	Wheat straw (85%) +Paddy straw (15%)	85.00	85.67	85.33
T ₆	Wheat straw (80%) +Paddy straw (20%)	84.33	85.00	84.67
T ₇	Wheat straw (75%) +Paddy straw (25%)	86.00	87.00	86.50
T ₈	Wheat straw (70%) +Paddy straw (30%)	87.00	87.33	87.17
T ₉	Wheat straw (65%) +Paddy straw (35%)	87.00	87.67	87.33
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	87.33	88.00	87.67
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	88.67	88.33	88.50
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	89.67	89.33	89.50
	General mean	86.78	87.28	87.03
	S.Em (\pm)	0.83	0.70	0.58
	C.D. at 5%	2.43	2.04	1.64

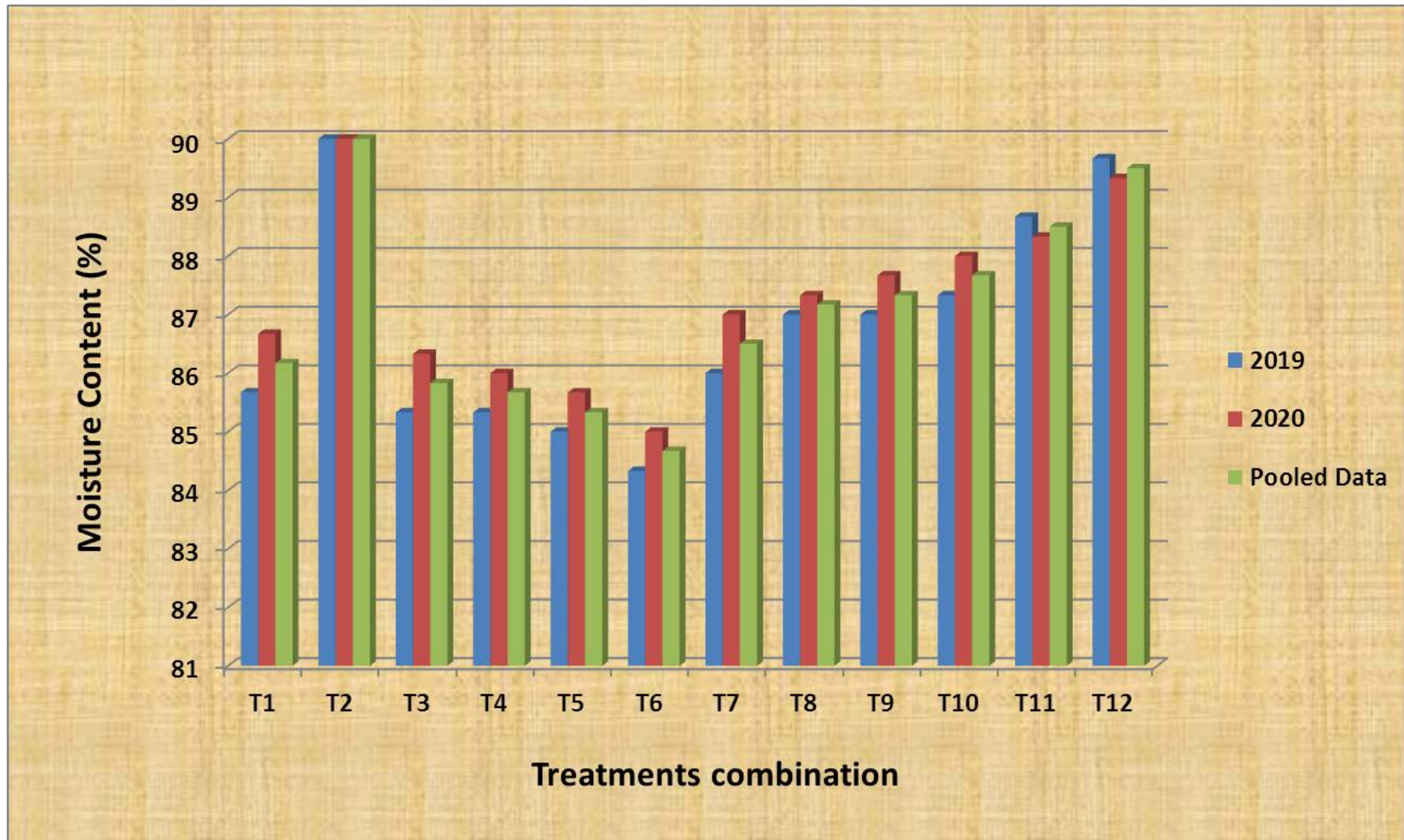


Fig.4.22: The effect of different treatments combination on moisture content (%) of Oyster mushroom

The general mean for this character was 857.72 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (905.00 g) and T₄ (896.33 g) treatments.

During the second year of the investigation, the results showed that the total yield was significantly influenced with different treatments combination. The maximum total yield (890.00 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 881.33 g), T₄ (Wheat straw 90% + Paddy straw 10%, 871.67 g), T₃ (Wheat straw 85% + Paddy straw 15%, 846.33 g) and T₁ (Wheat straw 100%, 842.00 g). The minimum total yield was recorded in treatment T₂ (Paddy straw 100%, 778.67 g). The general mean for this character was 830.81 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (881.33 g) and T₄ (871.67 g) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the total yield with different treatments combination. The maximum total yield (902.67 g) was found to be in T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 893.17 g), T₄ (Wheat straw 90% + Paddy straw 10%, 884.00 g), T₃ (Wheat straw 85% + Paddy straw 15%, 865.67 g) and T₁ (Wheat straw 100%, 856.83 g). The minimum total yield was recorded in treatment T₂ (Paddy straw 100%, 788.50 g). The general mean for this character was 844.26 g. The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with T₅ (893.17 g) and T₄ (884.00 g) treatments.

4.21. Biological efficiency

The two year of data (2019 and 2020) pertaining to the biological efficiency along with pooled data have been presented in Table 4.21 and graphically depicted in Fig. 4.21.

During the first year of the investigation, the results showed that biological efficiency was significantly influenced with different treatments combination. The maximum biological efficiency (90.00) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 89.67), T₄ (Wheat straw 90% + Paddy straw 10%, 89.00), T₃ (Wheat straw 85% + Paddy straw 15%, 88.67) and T₁ (Wheat straw 100%, 88.33) whereas

Table- 4.23: The effect of different treatments combination on dry matter content of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw(100%)	14.33	13.33	13.83
T ₂	Paddy straw (100%)	10.00	10.00	10.00
T ₃	Wheat straw (95%) +Paddy straw (5%)	14.67	13.67	14.17
T ₄	Wheat straw (90%) +Paddy straw (10%)	14.67	14.00	14.33
T ₅	Wheat straw (85%) +Paddy straw (15%)	15.00	14.33	14.67
T ₆	Wheat straw (80%) +Paddy straw (20%)	15.67	15.00	15.33
T ₇	Wheat straw (75%) +Paddy straw (25%)	14.00	13.00	13.50
T ₈	Wheat straw (70%) +Paddy straw (30%)	13.00	12.67	12.83
T ₉	Wheat straw (65%) +Paddy straw (35%)	13.00	12.33	12.67
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	12.67	12.00	12.33
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	11.33	11.67	11.50
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	10.33	10.67	10.50
	General mean	13.22	12.72	12.97
	S.Em (±)	0.81	0.73	0.51
	C.D. at 5%	2.35	2.14	1.44

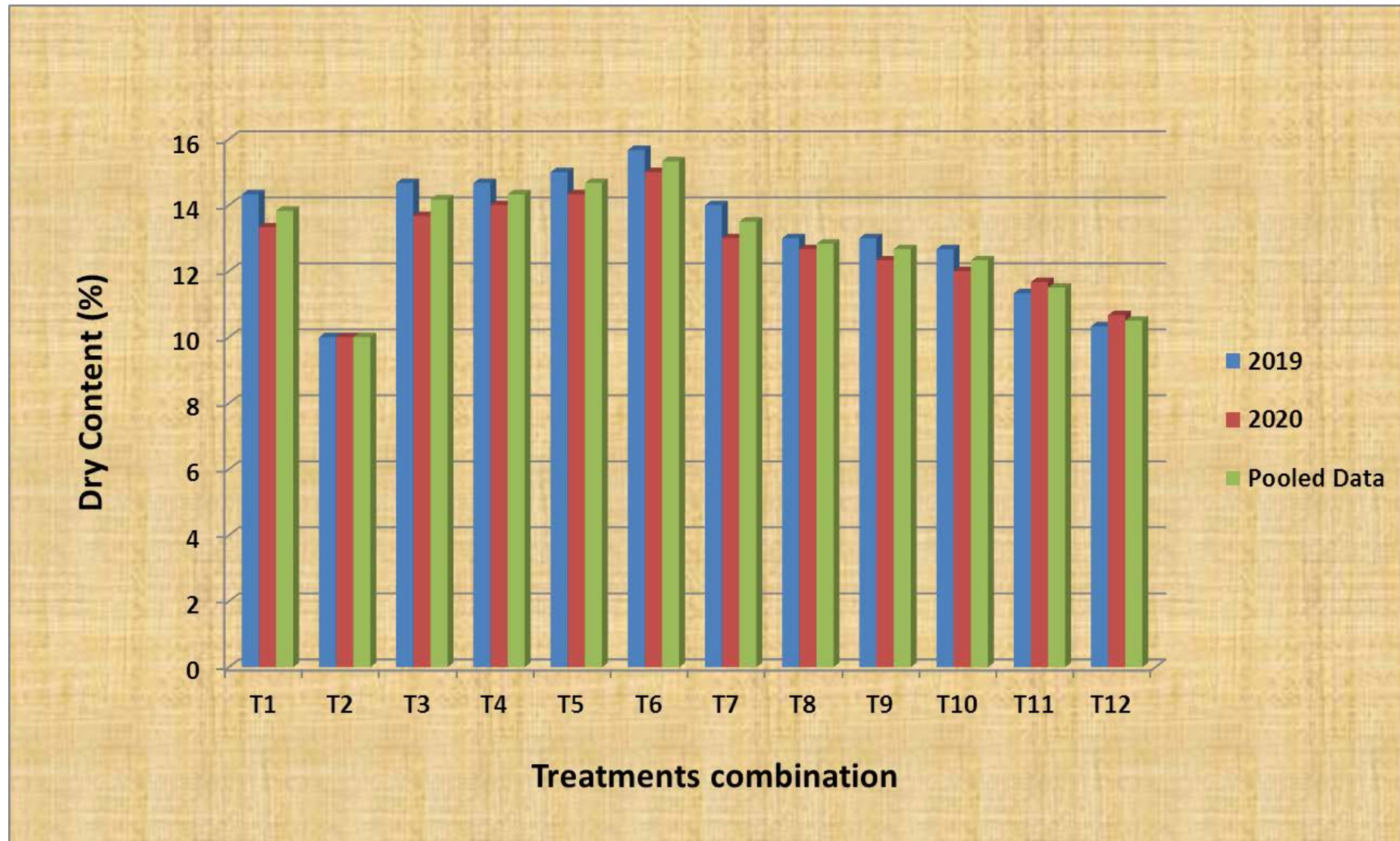


Fig. 4.23: The effect of different treatments combination on dry matter content of Oyster mushroom

minimum (84.33) was taken to biological efficiency was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (89.67), T₄ (89.00), T₃ (88.67) and T₁ (88.33) treatments.

During the second year of the investigation, the results showed that biological efficiency was significantly influenced with different treatments combination. The maximum biological efficiency (89.00) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 88.67), T₄ (Wheat straw 90% + Paddy straw 10%, 88.33), T₃ (Wheat straw 85% + Paddy straw 15%, 88.00), T₁ (Wheat straw 100%, 87.00) and T₇ (Wheat straw 75% + Paddy straw 25%, 86.33), whereas minimum (84.00) was taken to biological efficiency was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (88.67), T₄ (88.33), T₃ (88.00), T₁ (87.00) and T₁ (87.00) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the biological efficiency with different treatments combination. The maximum biological efficiency (89.50) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 89.17), T₄ (Wheat straw 90% + Paddy straw 10%, 88.67), T₃ (Wheat straw 85% + Paddy straw 15%, 88.33), T₁ (Wheat straw 100%, 87.67) and T₇ (Wheat straw 75% + Paddy straw 25%, 86.00), whereas minimum (84.17) was taken to biological efficiency was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (89.17), T₄ (88.67) and T₃ (88.33) treatments.

4.22. Moisture content (%)

The two year of data (2019 and 2020) pertaining to the moisture content (%) along with pooled data have been presented in Table 4.22. and graphically depicted in Fig. 4.22.

During the first year of the investigation, the results showed that moisture content was significantly influenced with different treatments combination. The minimum moisture content (84.33) were recorded in treatment T₆ (Wheat straw 80%

Table- 4.24: The effect of different treatments combination on pH content of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	7.0	7.0	7.0
T ₂	Paddy straw (100%)	6.5	6.5	6.5
T ₃	Wheat straw (95%) +Paddy straw (5%)	7.1	7.1	7.1
T ₄	Wheat straw (90%) +Paddy straw (10%)	7.2	7.3	7.3
T ₅	Wheat straw (85%) +Paddy straw (15%)	7.3	7.4	7.4
T ₆	Wheat straw (80%) +Paddy straw (20%)	7.4	7.4	7.4
T ₇	Wheat straw (75%) +Paddy straw (25%)	7.2	7.3	7.2
T ₈	Wheat straw (70%) +Paddy straw (30%)	7.0	7.0	7.0
T ₉	Wheat straw (65%) +Paddy straw (35%)	6.9	6.8	6.8
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	6.8	6.7	6.8
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	6.7	6.6	6.7
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	6.6	6.6	6.6
	General mean	6.98	7.0	7.0
	S.Em (\pm)	0.07	0.08	0.05
	C.D. at 5%	0.20	0.24	0.14

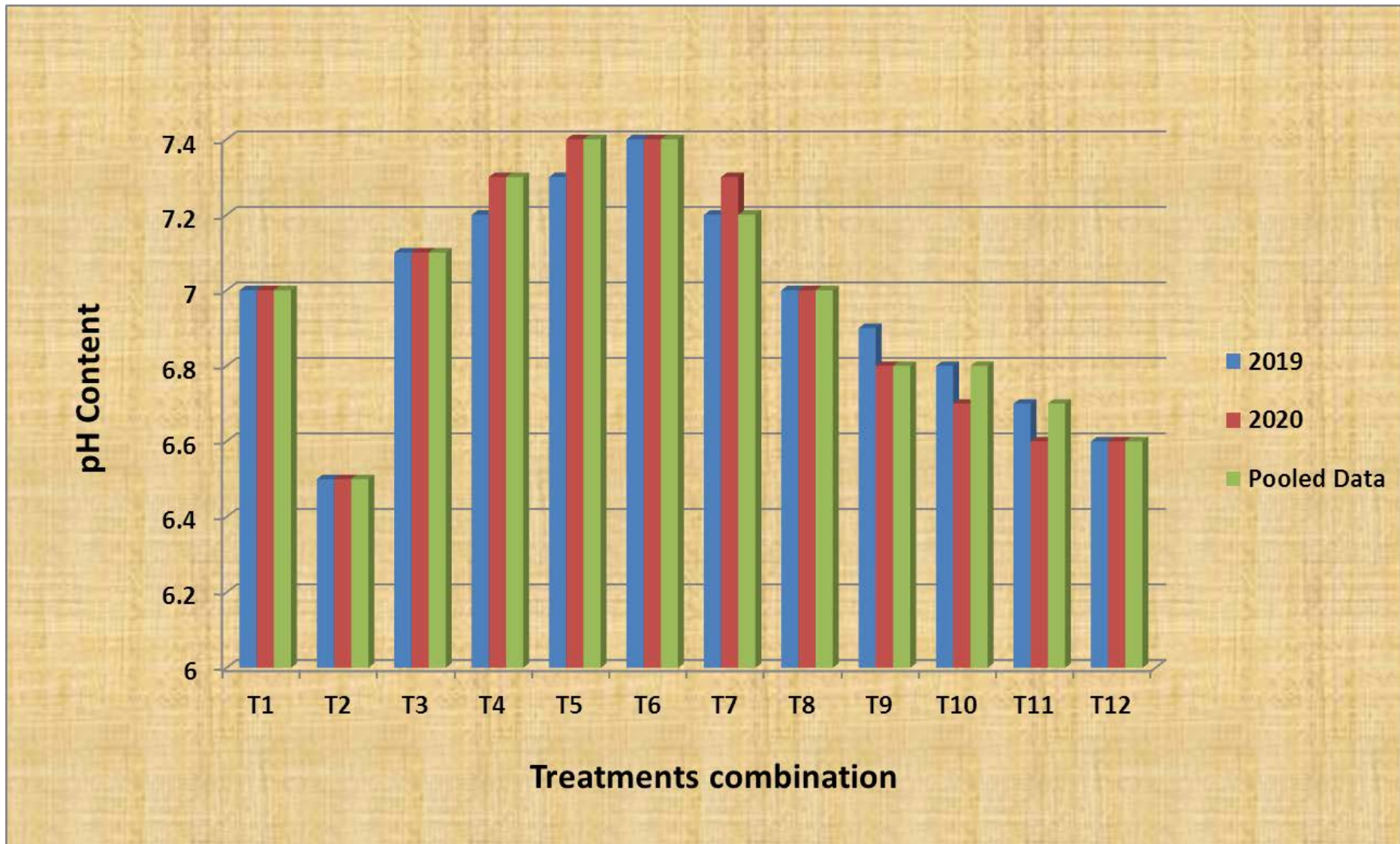


Fig. 4.24: The effect of different treatments combination on pH content of Oyster mushroom

+ Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 85.00), T₄ (Wheat straw 90% + Paddy straw 10%, 85.33), T₃ (Wheat straw 85% + Paddy straw 15%, 85.33) and T₁ (Wheat straw 100%, 85.67) whereas maximum (90.00) was taken to moisture content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (85.00), T₄ (85.33), T₃ (85.33) and T₁ (85.67) treatments.

During the second year of the investigation, the results showed that moisture content was significantly influenced with different treatments combination. The minimum moisture content (85.00) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 85.67), T₄ (Wheat straw 90% + Paddy straw 10%, 86.00), T₃ (Wheat straw 85% + Paddy straw 15%, 86.33) and T₁ (Wheat straw 100%, 86.67), whereas maximum (90.00) was taken to moisture content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (85.67), T₄ (86.00), T₃ (86.33) and T₁ (86.67) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the moisture content with different treatments combination. The minimum moisture content (84.67) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 85.33), T₃ (Wheat straw 85% + Paddy straw 15%, 85.83), T₄ (Wheat straw 90% + Paddy straw 10%, 85.67) and T₁ (Wheat straw 100%, 86.17), whereas maximum (90.00) was taken to moisture content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (85.33), T₄ (85.67), T₃ (85.83) and T₁ (86.17) treatments.

4.23. Dry matter content (%)

The two year of data (2019 and 2020) pertaining to the dry matter content (%) along with pooled data have been presented in Table 4.23. and graphically depicted in Fig. 4.23.

During the first year of the investigation, the results showed that dry matter content was significantly influenced with different treatments combination.

Table- 4.25: The effect of different treatments combination on acidity content (%) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	0.050	0.052	0.051
T ₂	Paddy straw (100%)	0.063	0.058	0.061
T ₃	Wheat straw (95%) +Paddy straw (5%)	0.037	0.038	0.038
T ₄	Wheat straw (90%) +Paddy straw (10%)	0.037	0.038	0.038
T ₅	Wheat straw (85%) +Paddy straw (15%)	0.038	0.042	0.040
T ₆	Wheat straw (80%) +Paddy straw (20%)	0.035	0.037	0.036
T ₇	Wheat straw (75%) +Paddy straw (25%)	0.043	0.045	0.044
T ₈	Wheat straw (70%) +Paddy straw (30%)	0.048	0.050	0.049
T ₉	Wheat straw (65%) +Paddy straw (35%)	0.048	0.050	0.049
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	0.050	0.052	0.051
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	0.052	0.053	0.053
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	0.053	0.055	0.054
	General mean	0.046	0.048	0.047
	S.Em (\pm)	0.00	0.00	0.00
	C.D. at 5%	0.01	0.01	0.01

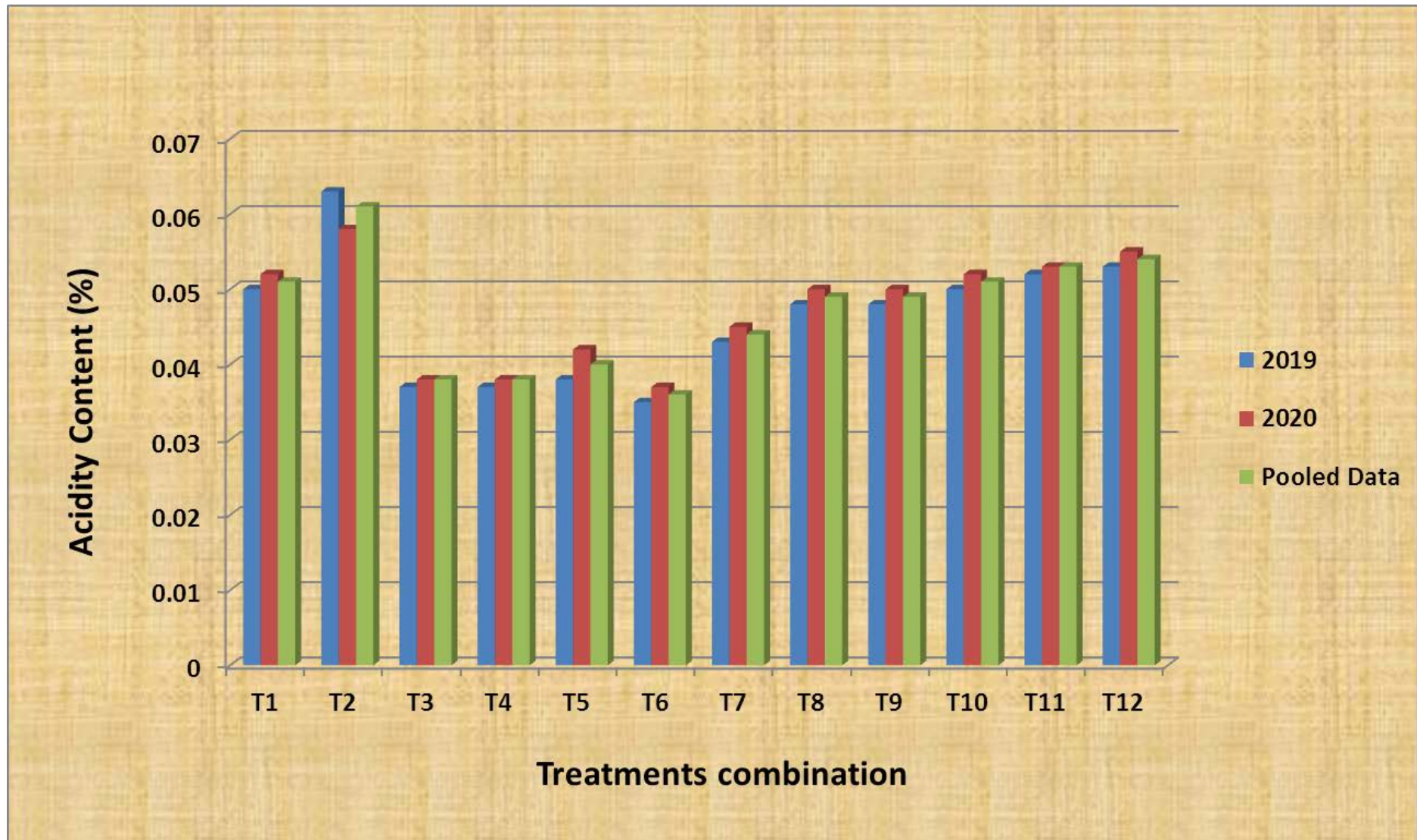


Fig. 4.25: The effect of different treatments combination on acidity content (%) of Oyster mushroom

The maximum dry matter content (15.67) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 15.00), T₄ (Wheat straw 90% + Paddy straw 10%, 14.67), T₃ (Wheat straw 85% + Paddy straw 15%, 14.67) and T₁ (Wheat straw 100%, 14.33) whereas minimum (10.00) was taken to dry matter content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (15.00), T₄ (14.67), T₃ (14.67), T₁ (14.33) and T₇ (14.00) treatments.

During the second year of the investigation, the results showed that dry matter content was significantly influenced with different treatments combination. The maximum dry matter content (15.00) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 14.33), T₄ (Wheat straw 90% + Paddy straw 10%, 14.00), T₃ (Wheat straw 85% + Paddy straw 15%, 13.67) and T₁ (Wheat straw 100%, 13.33), whereas minimum (10.00) was taken to dry matter content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (14.33), T₄ (14.00), T₃ (13.67), T₁ (13.33) and T₇ (13.00) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the dry matter content with different treatments combination. The maximum dry matter content (15.33) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 14.67), T₄ (Wheat straw 90% + Paddy straw 10%, 14.33), T₃ (Wheat straw 85% + Paddy straw 15%, 14.17) and T₁ (Wheat straw 100%, 13.83), whereas minimum (10.00) was taken to dry matter content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (14.67), T₄ (14.33) and T₃ (14.17) treatments.

4.24. pH content

The two year of data (2019 and 2020) pertaining to the pH content along with pooled data have been presented in Table 4.24 and graphically depicted in Fig. 4.24.

During the first year of the investigation, the results showed that pH content was significantly influenced with different treatments combination.

Table- 4.26: The effect of different treatments combination on total soluble solids (⁰Brix) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	3.25	3.26	3.26
T ₂	Paddy straw (100%)	3.94	3.96	3.95
T ₃	Wheat straw (95%) +Paddy straw (5%)	3.19	3.21	3.20
T ₄	Wheat straw (90%) +Paddy straw (10%)	3.13	3.14	3.13
T ₅	Wheat straw (85%) +Paddy straw (15%)	3.06	3.07	3.06
T ₆	Wheat straw (80%) +Paddy straw (20%)	3.01	3.04	3.03
T ₇	Wheat straw (75%) +Paddy straw (25%)	3.19	3.20	3.19
T ₈	Wheat straw (70%) +Paddy straw (30%)	3.22	3.24	3.23
T ₉	Wheat straw (65%) +Paddy straw (35%)	3.30	3.31	3.31
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	3.44	3.46	3.45
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	3.63	3.64	3.64
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	3.76	3.77	3.77
	General mean	3.34	3.36	3.35
	S.Em (±)	0.05	0.05	0.03
	C.D. at 5%	0.15	0.15	0.09

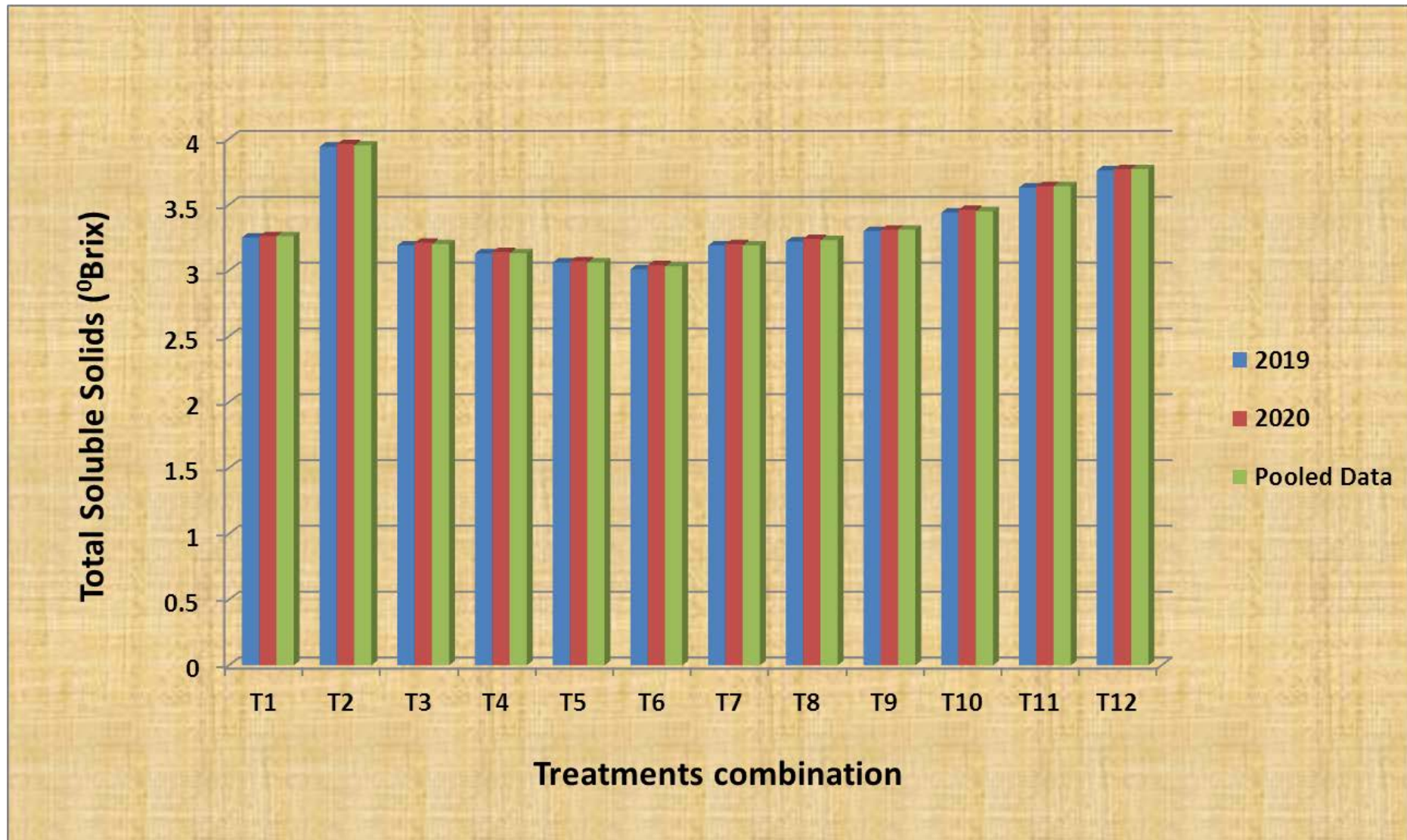


Fig. 4.26: The effect of different treatments combination on total soluble solids (°Brix) of Oyster mushroom

The maximum Ph content (7.4) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 7.3), T₄ (Wheat straw 90% + Paddy straw 10%, 7.2), T₃ (Wheat straw 85% + Paddy straw 15%, 7.1) and T₁ (Wheat straw 100%, 7.0), whereas minimum (6.5) was taken to pH content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (7.3) and T₄ (7.2) treatments.

During the second year of the investigation, the results showed that pH content was significantly influenced with different treatments combination. The maximum pH content (7.4) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 7.4), T₄ (Wheat straw 90% + Paddy straw 10%, 7.3), T₃ (Wheat straw 85% + Paddy straw 15%, 7.1) and T₁ (Wheat straw 100%, 7.0), whereas minimum (6.5) was taken to pH content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (7.4) and T₄ (7.3) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the pH content with different treatments combination. The maximum pH content (7.4) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 7.4), T₄ (Wheat straw 90% + Paddy straw 10%, 7.3), T₃ (Wheat straw 85% + Paddy straw 15%, 7.1) and T₁ (Wheat straw 100%, 7.0), whereas minimum (6.5) was taken to pH content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (7.4) and T₄ (7.3) treatments.

4.25. Acidity content (%)

The two year of data (2019 and 2020) pertaining to the acidity content (%) along with pooled data have been presented in Table 4.25. and graphically depicted in Fig. 4.25.

Table- 4.27: The effect of different treatments combination on ascorbic acid (mg/100g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	14.23	14.40	14.32
T ₂	Paddy straw (100%)	18.17	18.30	18.23
T ₃	Wheat straw (95%) +Paddy straw (5%)	14.00	14.10	14.05
T ₄	Wheat straw (90%) +Paddy straw (10%)	13.13	13.30	13.22
T ₅	Wheat straw (85%) +Paddy straw (15%)	12.97	12.97	12.97
T ₆	Wheat straw (80%) +Paddy straw (20%)	12.67	12.87	12.77
T ₇	Wheat straw (75%) +Paddy straw (25%)	14.30	14.33	14.32
T ₈	Wheat straw (70%) +Paddy straw (30%)	14.87	15.03	14.95
T ₉	Wheat straw (65%) +Paddy straw (35%)	15.40	15.63	15.52
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	15.67	15.90	15.78
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	16.17	16.27	16.22
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	16.23	16.30	16.27
	General mean	14.82	14.95	14.88
	S.Em (±)	0.23	0.22	0.15
	C.D. at 5%	0.67	0.65	0.42

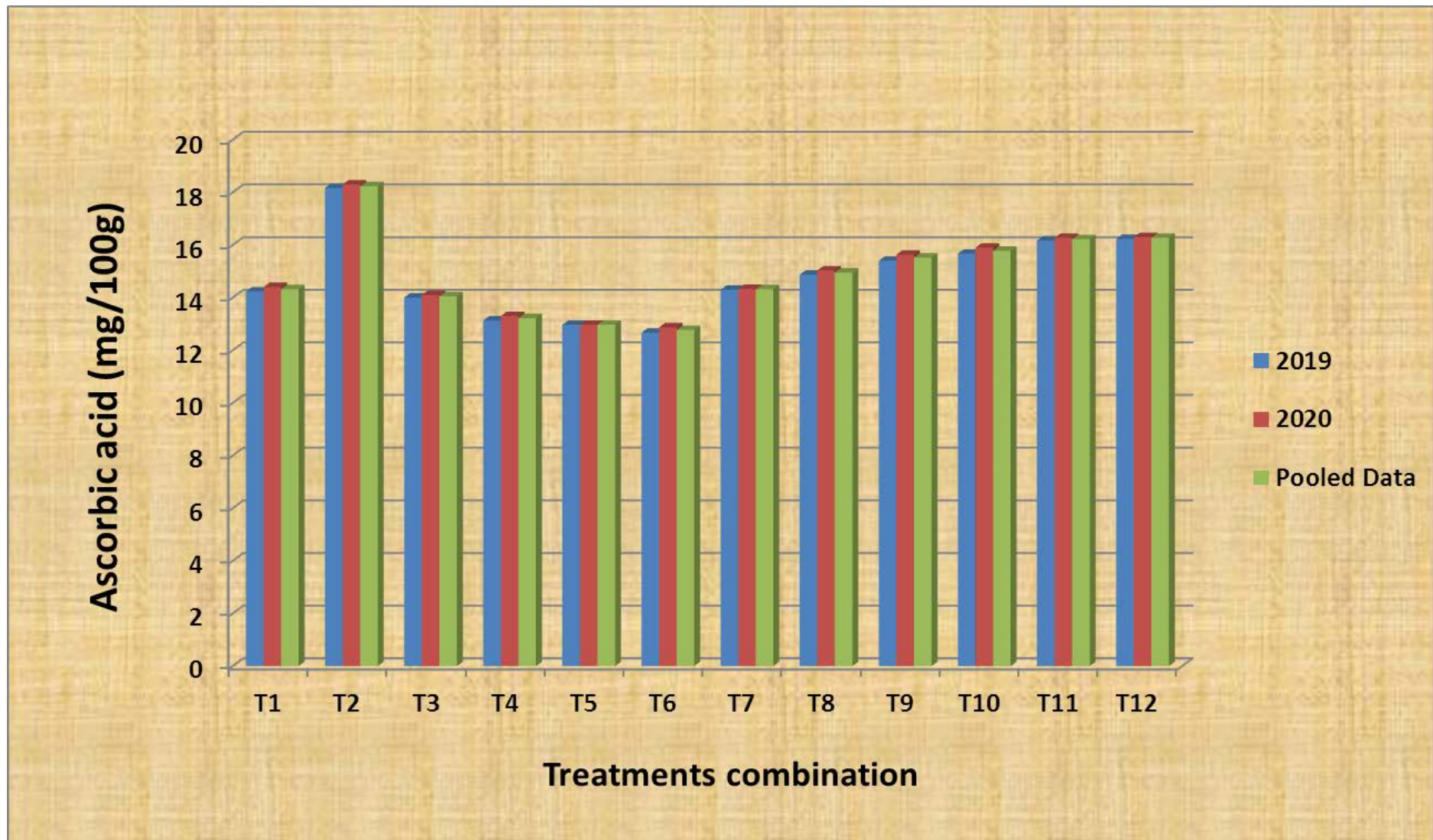


Fig.4.27: The effect of different treatments combination on ascorbic acid (mg/100g) of Oyster mushroom

During the first year of the investigation, the results showed that acidity content was significantly influenced with different treatments combination. The minimum acidity content (0.035) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 0.038), T₄ (Wheat straw 90% + Paddy straw 10%, 0.037), T₃ (Wheat straw 85% + Paddy straw 15%, 0.037) and T₁ (Wheat straw 100%, 0.050) whereas maximum (0.063) was taken to acidity content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (0.038), T₄ (0.037) and T₃ (0.037) treatments.

During the second year of the investigation, the results showed that acidity content was significantly influenced with different treatments combination. The minimum acidity content (0.037) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₄ (Wheat straw 90% + Paddy straw 10%, 0.038), T₃ (Wheat straw 85% + Paddy straw 15%, 0.038), T₅ (Wheat straw 85% + Paddy straw 15%, 0.042) and T₁ (Wheat straw 100%, 0.052) whereas maximum (0.058) was taken to acidity content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₄ (0.038), T₃ (0.038) and T₁ (0.052) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the acidity content with different treatments combination. The minimum acidity content (0.036) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₃ (Wheat straw 85% + Paddy straw 15%, 0.038), T₅ (Wheat straw 90% + Paddy straw 10%, 0.040), T₄ (Wheat straw 85% + Paddy straw 15%, 0.042) and T₁ (Wheat straw 100%, 0.051) whereas maximum (0.061) was taken to acidity content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₃ (0.038), T₅ (0.042) and T₄ (0.038) treatments.

4.26. Total soluble solids (⁰B)

The two year of data (2019 and 2020) pertaining to the total soluble solids (⁰B) aalong with pooled data have been presented in Table 4.26. and graphically depicted in Fig. 4.26.

Table- 4.28: The effect of different treatments combination on total sugars (mg/100g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	37.53	38.13	37.83
T ₂	Paddy straw (100%)	45.90	46.07	45.98
T ₃	Wheat straw (95%) +Paddy straw (5%)	36.73	36.53	36.63
T ₄	Wheat straw (90%) +Paddy straw (10%)	35.87	35.77	35.82
T ₅	Wheat straw (85%) +Paddy straw (15%)	35.43	35.50	35.47
T ₆	Wheat straw (80%) +Paddy straw (20%)	35.13	35.07	35.10
T ₇	Wheat straw (75%) +Paddy straw (25%)	38.90	38.93	38.92
T ₈	Wheat straw (70%) +Paddy straw (30%)	40.70	39.07	39.88
T ₉	Wheat straw (65%) +Paddy straw (35%)	41.97	41.77	41.87
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	42.90	42.90	42.90
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	43.43	44.33	43.88
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	44.17	45.30	44.73
	General mean	39.89	39.95	39.92
	S.Em (\pm)	0.53	0.28	0.26
	C.D. at 5%	1.09	0.82	0.73

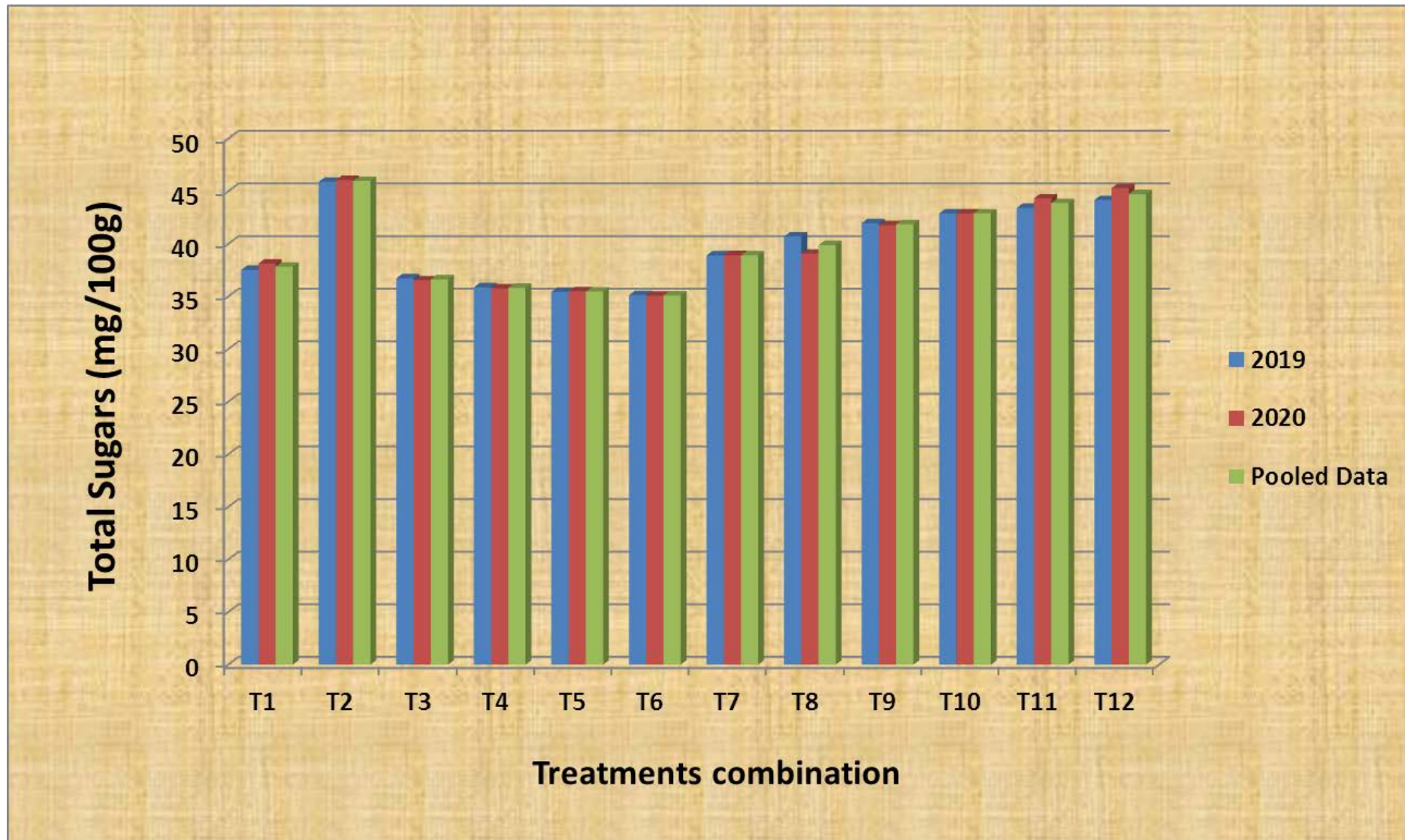


Fig.4.28: The effect of different treatments combination on total sugars (mg/100g) of Oyster mushroom

During the first year of the investigation, the results showed that total soluble solid was significantly influenced with different treatments combination. The minimum total soluble solids (3.01) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.06), T₄ (Wheat straw 90% + Paddy straw 10%, 3.13), T₃ (Wheat straw 85% + Paddy straw 15%, 3.19), T₁ (Wheat straw 100%, 3.25) and T₇ (Wheat straw 75% + Paddy straw 25%, 3.19) whereas maximum (3.94) was taken to total soluble solids was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (3.06) and T₄ (3.13) treatments.

During the second year of the investigation, the results showed that total soluble solid was significantly influenced with different treatments combination. The minimum total soluble solids (3.04) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.07), T₄ (Wheat straw 90% + Paddy straw 10%, 3.14), T₃ (Wheat straw 85% + Paddy straw 15%, 3.21), T₁ (Wheat straw 100%, 3.26) and T₇ (Wheat straw 75% + Paddy straw 25%, 3.20), whereas maximum (3.96) was taken to total soluble solids was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (3.07) and T₄ (3.14) treatments

Findings based on pooled data revealed that treatment was significantly influenced on the total soluble solids with different treatments combination. The minimum total soluble solids (3.03) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 3.06), T₄ (Wheat straw 90% + Paddy straw 10%, 3.13), T₃ (Wheat straw 85% + Paddy straw 15%, 3.20), T₁ (Wheat straw 100%, 3.26) and T₇ (Wheat straw 75% + Paddy straw 25%, 3.19), whereas maximum (3.96) was taken to total soluble solids was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (3.06) treatment.

Table- 4.29: The effect of different treatments combination on protein content (mg/100g) of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	23.43	23.57	23.50
T ₂	Paddy straw (100%)	20.73	20.87	20.80
T ₃	Wheat straw (95%) +Paddy straw (5%)	23.40	24.20	23.80
T ₄	Wheat straw (90%) +Paddy straw (10%)	24.80	24.57	24.68
T ₅	Wheat straw (85%) +Paddy straw (15%)	25.03	24.80	24.92
T ₆	Wheat straw (80%) +Paddy straw (20%)	25.17	25.00	25.08
T ₇	Wheat straw (75%) +Paddy straw (25%)	23.37	23.53	23.45
T ₈	Wheat straw (70%) +Paddy straw (30%)	23.20	23.40	23.30
T ₉	Wheat straw (65%) +Paddy straw (35%)	22.40	22.53	22.47
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	22.10	22.20	22.15
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	22.07	21.90	21.98
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	22.07	22.03	22.05
	General mean	23.15	23.22	23.18
	S.Em (\pm)	0.24	0.32	0.19
	C.D. at 5%	0.70	0.93	0.53

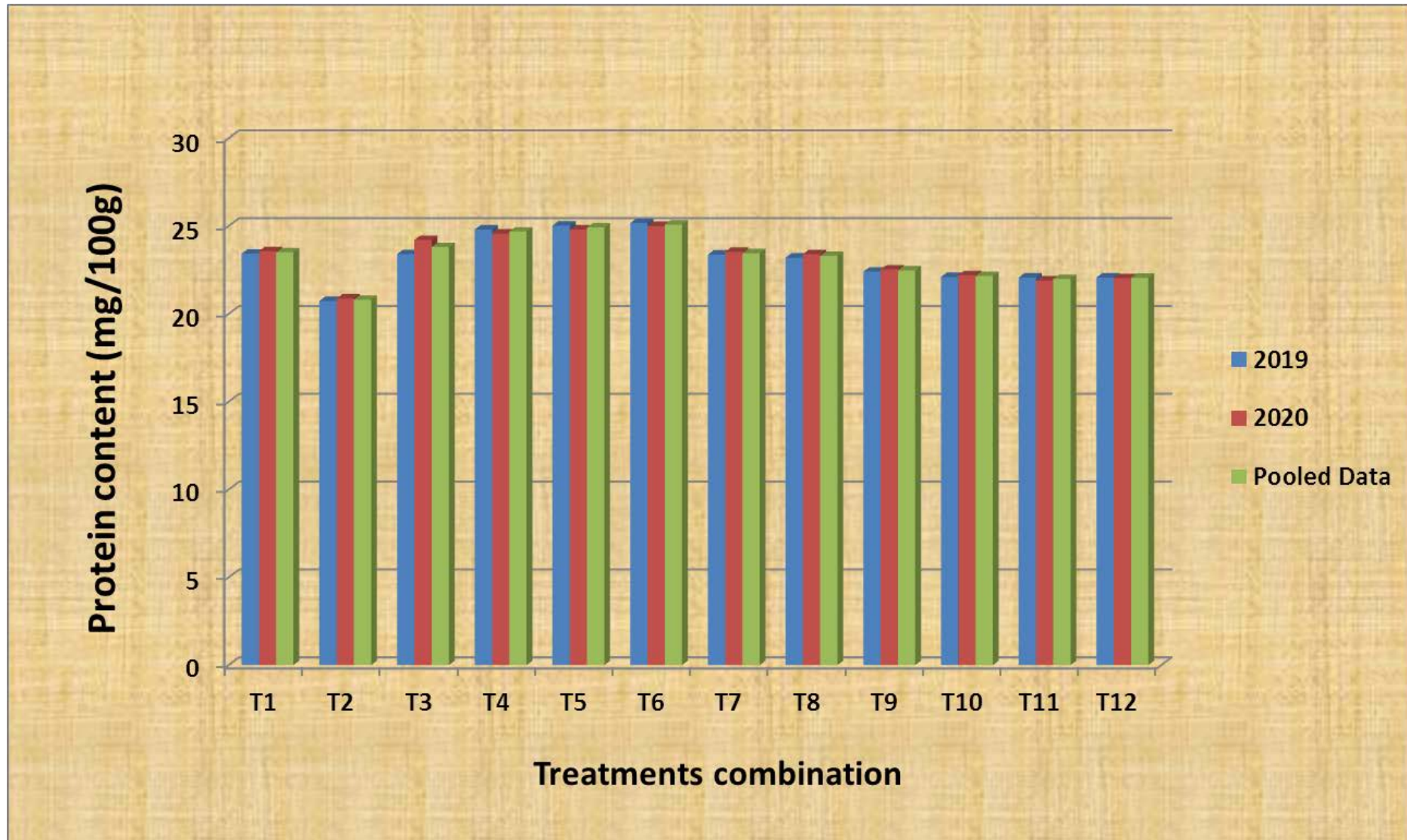


Fig. 4.29: The effect of different treatments combination on protein content of Oyster mushroom

4.27. Ascorbic acid (mg/100mg)

The two year of data (2019 and 2020) pertaining to the ascorbic acid (mg/100mg) along with pooled data have been presented in Table 4.27. and graphically depicted in Fig. 4.27.

During the first year of the investigation, the results showed that ascorbic acid was significantly influenced with different treatments combination. The minimum ascorbic acid (12.67) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 12.97), T₄ (Wheat straw 90% + Paddy straw 10%, 13.13), T₃ (Wheat straw 85% + Paddy straw 15%, 14.00), T₁ (Wheat straw 100%, 14.23) and T₇ (Wheat straw 75% +Paddy straw 25%, 14.30) whereas maximum (18.17) was taken to ascorbic acid was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (12.97) and T₄ (13.13) treatments.

During the second year of the investigation, the results showed that ascorbic acid was significantly influenced with different treatments combination. The minimum ascorbic acid (12.87) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 12.97), T₄ (Wheat straw 90% + Paddy straw 10%, 13.30), T₃ (Wheat straw 85% + Paddy straw 15%, 14.10), T₁ (Wheat straw 100%, 14.40) and T₇ (Wheat straw 75% +Paddy straw 25%, 14.33) whereas maximum (18.30) was taken to ascorbic acid was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (12.97) and T₄ (13.30) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the ascorbic acid with different treatments combination. The minimum ascorbic acid (12.77) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 12.97), T₄ (Wheat straw 90% + Paddy straw 10%, 13.22), T₃ (Wheat straw 85% + Paddy straw 15%, 14.05), T₁ (Wheat straw 100%, 14.32) and T₇ (Wheat straw 75% +Paddy straw 25%, 14.32) whereas maximum (18.23) was taken to ascorbic acid was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (12.97) treatment.

Table- 4.30: The effect of different treatments combination on benefit: cost ratio of Oyster mushroom

Symbol	Treatments combinations	2019	2020	Pooled Data
T ₁	Wheat straw (100%)	1.61	1.62	1.62
T ₂	Paddy straw (100%)	1.30	1.32	1.31
T ₃	Wheat straw (95%) +Paddy straw (5%)	1.63	1.63	1.63
T ₄	Wheat straw (90%) +Paddy straw (10%)	1.68	1.67	1.67
T ₅	Wheat straw (85%) +Paddy straw (15%)	1.69	1.69	1.69
T ₆	Wheat straw (80%) +Paddy straw (20%)	1.72	1.72	1.72
T ₇	Wheat straw (75%) +Paddy straw (25%)	1.61	1.61	1.61
T ₈	Wheat straw (70%) +Paddy straw (30%)	1.59	1.59	1.59
T ₉	Wheat straw (65%) +Paddy straw (35%)	1.54	1.54	1.54
T ₁₀	Wheat straw (60%) +Paddy straw (40%)	1.50	1.51	1.51
T ₁₁	Wheat straw (55%) +Paddy straw (45%)	1.48	1.49	1.48
T ₁₂	Wheat straw (50%) +Paddy straw (50%)	1.43	1.44	1.44
	General mean	1.56	1.57	1.57
	S.Em (±)	0.03	0.03	0.02
	C.D. at 5%	0.10	0.10	0.06

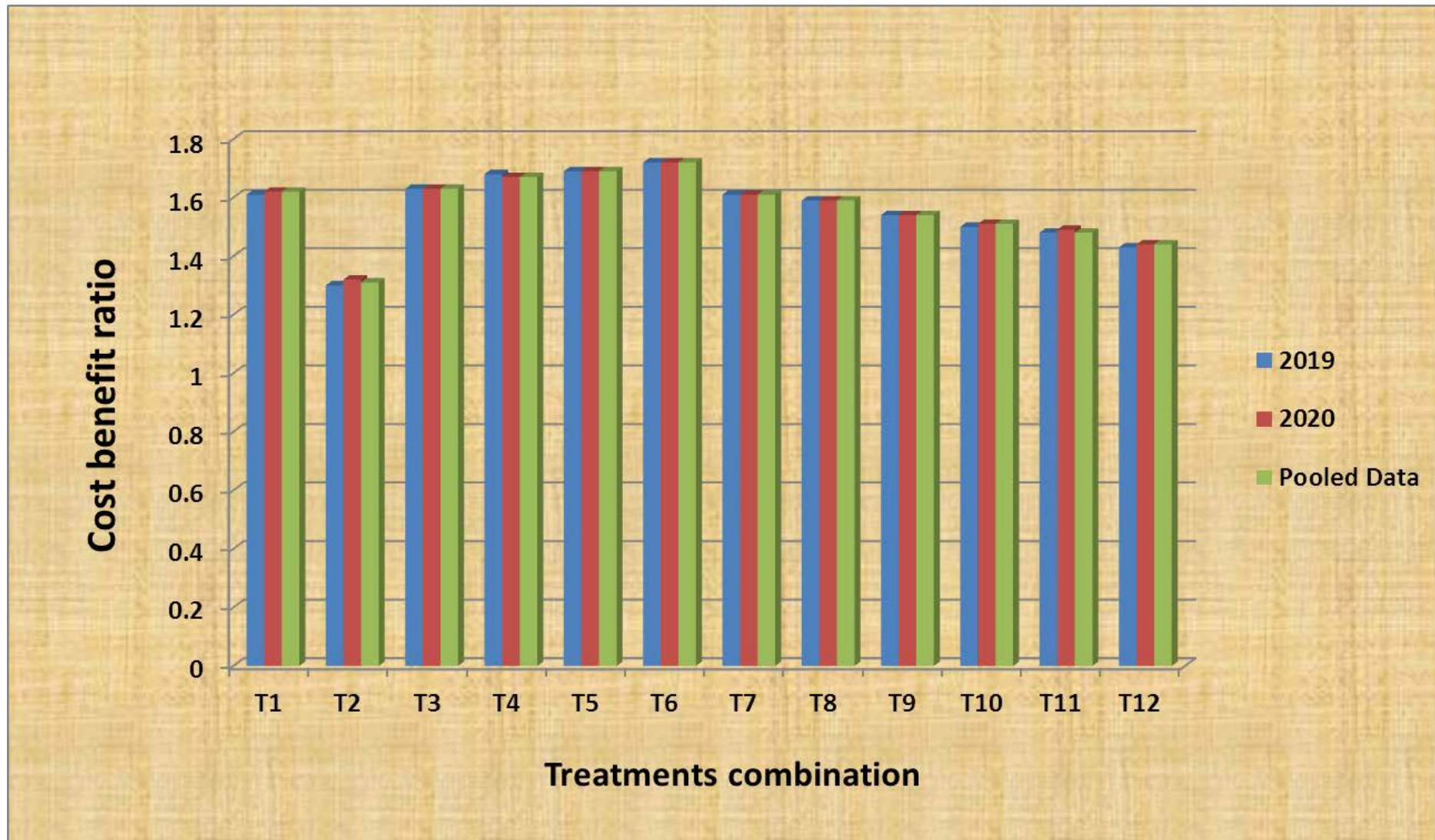


Fig. 4.30: The effect of different treatments combination on benefit: cost ratio of Oyster mushroom

4.28. Total sugars (mg/100mg)

The two year of data (2019 and 2020) pertaining to the ascorbic acid (mg/100mg) aalong with pooled data have been presented in Table 4.28. and graphically depicted in Fig. 4.28.

During the first year of the investigation, the results showed that total sugars were significantly influenced with different treatments combination. The minimum total sugars (35.13) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 35.43), T₄ (Wheat straw 90% + Paddy straw 10%, 35.87), T₃ (Wheat straw 85% + Paddy straw 15%, 36.73), T₁ (Wheat straw 100%, 37.53) and T₇ (Wheat straw 75% +Paddy straw 25%, 39.23), whereas maximum (45.90) was taken to total sugars was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (35.43) and T₄ (35.87) treatments.

During the second year of the investigation, the results showed that total sugars were significantly influenced with different treatments combination. The minimum total sugars (35.07) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 35.50), T₄ (Wheat straw 90% + Paddy straw 10%, 35.77), T₃ (Wheat straw 85% + Paddy straw 15%, 36.53), T₁ (Wheat straw 100%, 38.13) and T₇ (Wheat straw 75% +Paddy straw 25%, 38.93), whereas maximum (46.07) was taken to total sugars was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (35.50) and T₄ (35.77) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the total sugars with different treatments combination. The minimum total sugars (35.10) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 35.47), T₄ (Wheat straw 90% + Paddy straw 10%, 35.82), T₃ (Wheat straw 85% + Paddy straw 15%, 36.63), T₁ (Wheat straw 100%, 37.83) and T₇ (Wheat straw 75% +Paddy straw 25%, 38.92), whereas maximum (45.98) was taken to total sugars was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (35.47) and T₄ (35.82) treatments.

4.29. Protein content (mg/100mg)

The two year of data (2019 and 2020) pertaining to the protein content (mg/100mg) along with pooled data have been presented in Table 4.29. and graphically depicted in Fig. 4.29.

During the first year of the investigation, the results showed that protein content were significantly influenced with different treatments combination. The minimum protein content (25.17) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 25.03), T₄ (Wheat straw 90% + Paddy straw 10%, 24.80), T₃ (Wheat straw 85% + Paddy straw 15%, 23.40) and T₁ (Wheat straw 100%, 23.43), whereas maximum (25.17) was taken to protein content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (25.03) and T₄ (24.80) treatments.

During the second year of the investigation, the results showed that protein content were significantly influenced with different treatments combination. The maximum protein content (25.00) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 24.80), T₄ (Wheat straw 90% + Paddy straw 10%, 24.57), T₃ (Wheat straw 85% + Paddy straw 15%, 24.20) and T₁ (Wheat straw 100%, 23.857), whereas minimum (20.87) was taken to protein content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (24.80) and T₄ (24.57) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the protein content with different treatments combination. The maximum protein content (25.08) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 24.92), T₄ (Wheat straw 90% + Paddy straw 10%, 24.68), T₃ (Wheat straw 85% + Paddy straw 15%, 23.80) and T₁ (Wheat straw 100%, 23.50), whereas minimum (20.80) was taken to protein content was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (24.92) and T₄ (24.608) treatments.

4.30. Benefit : cost ratio

The two year of data (2019 and 2020) pertaining to the benefit cost ratio aalong with pooled data have been presented in Table 4.30. and graphically depicted in Fig. 4.30.

During the first year of the investigation, the results showed that benefit : cost ratio were significantly influenced with different treatments combination. The maximum benefit : cost ratio (1.72) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 1.69), T₄ (Wheat straw 90% + Paddy straw 10%, 1.68), T₃ (Wheat straw 85% + Paddy straw 15%, 1.63) and T₁ (Wheat straw 100%, 1.61), whereas minimum (1.30) was taken to benefit : cost ratio was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (1.69), T₄ (1.68) and T₃ (1.63) treatments.

During the second year of the investigation, the results showed that benefit : cost ratio were significantly influenced with different treatments combination. The maximum benefit : cost ratio (1.72) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 1.69), T₄ (Wheat straw 90% + Paddy straw 10%, 1.67), T₃ (Wheat straw 85% + Paddy straw 15%, 1.63) and T₁ (Wheat straw 100%, 1.62), whereas minimum (1.32) was taken to benefit : cost ratio was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (1.69), T₄ (1.68), T₃ (1.63) and T₁ (1.62) treatments.

Findings based on pooled data revealed that treatment was significantly influenced on the benefit cost ratio with different treatments combination. The maximum benefit : cost ratio (1.72) were recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) followed by treatments T₅ (Wheat straw 85% + Paddy straw 15%, 1.69), T₄ (Wheat straw 90% + Paddy straw 10%, 1.67), T₃ (Wheat straw 85% + Paddy straw 15%, 1.63) and T₁ (Wheat straw 100%, 1.62), whereas minimum (1.31) was taken to benefit : cost ratio was recorded in treatment T₂ (Paddy straw 100%). The treatment T₆ (Wheat straw 80% + Paddy straw 20%) was statistically at par with the T₅ (1.69), T₄ (1.67) and T₃ (1.63) treatments.



Plate.1. Substrates (Wheat) Straw



Plate.2. Fungicides



Plate.3. Mixed Fungicides



Plate.4. Mixing along with water



Plate.5. Substrates thoroughly Mixed



Plate.6. Cover with airtight for 24 hours



Plate.7. Excess water drained



Plate.8. Remove excess moisture



Plate.9. Spawn



Plate.10. Preparation of bags



Plate.11. Prepared mushroom bags



Plate.12. Substrate spawn run ays



Plate.13. Fully developed fruiting bodies



Plate.14. Single Piece of Fruiting body



Plate.15. Weighing of fruiting body



16 Bunch of Fruiting body



Plate.17. View of all treatments

Discussion

The present experiment was undertaken to study the “**Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions**”. The experiment has been carried out at the Ph.D. research laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Rae bareli Road, Lucknow, 226 025 (U.P.) from October 2019 to December 2019 and October 2020 to December 2020. The findings of the present investigation have been interpreted and discussed in this chapter. The findings of the present experiments are discussed in the light of available literature and evidences provided by earlier workers. The effect of the various treatment combinations (paddy straw and wheat straw) in respect of oyster mushroom (*Pleurotus florida*) growth, nutritional composition and yield have been discussed.

5.1. Effect of different treatment combinations on growth attributes

5.1.1. Stipe length (cm)

Significantly maximum pooled length of stipe (3.94 cm) was recorded with wheat straw 80% along with paddy straw 20%. The difference in the growth pattern of these substrates may be related to different chemical compositions of these agro-industrial wastes. These results are in close conformity with the findings of **Jonathan et al. (2012)**.

5.1.2. Diameter of stipe (cm)

Significantly maximum pooled diameter of stipe (1.24 cm) was recorded with wheat straw 80% along with paddy straw 20%. It might be due to the supplemental growths on agricultural wastes showed positive correlation with available nutrients and favourable environmental conditions. The results are in accordance with the report of **Gbolagade et al. (2006)**.

5.1.3. Diameter of pileus (cm)

Significantly maximum pooled diameter of stipe (4.47 cm) was recorded with wheat straw 80% along with paddy straw 20%. It might be due to the size and shape

dependent on availability of cellulose, hemicelluloses, and lignin which provide incremental growth to presence of enzyme. The results are in accordance with the report of **Jonathan and Adeoyo (2011) and Fasidi et al. (2008)**

5.1.4. Diameter of fruiting bodies (cm)

Significantly maximum pooled diameter of fruiting bodies (12.32 cm) was recorded with wheat straw 80% along with paddy straw 20%. Organic supplement has been showed positive effect on vegetative parameters. Similar results obtained by **Sharma et al., (2013)** in *Colocybe indica*.

5.1.5. Primordial initiation days

The treatment showed that the significantly maximum pooled (20.67 days) days to primordia initiation was recorded with wheat straw 80% along with paddy straw 20%. Te results were in accordance with the report of **Tirkey (2017)**.

5.1.6. Pinhead formation days

Significantly maximum pooled days to pin head formation (24.00 days) was recorded with wheat straw 80% along with paddy straw 20%. The earlier appearance of pinheads in combination of wheat straw and paddy straw might be due to the C:N ratio availability. Similar results reported by **Tan (1981)**, **Shah et al. (1981)**, **Khan et al. (1981)** in species of *Pleurotus sajar-caju* and *Pleurotus ostreatus* and **Ramzan (1982)** found that 20-40 days of five *Pleurotus ostreatus* strains on wheat and paddy straw.

5.1.7. Maturity time of sporophore

The treatment showed that the significantly maximum pooled maturity time of sporophore (27.17 days) was recorded with wheat straw 80% along with paddy straw 20%. It might be due to the combining effects led to optimum activities in thermophilic fungi. This stage showed that the decomposition rate of carbohydrates to produce selective environment for mushroom growth. Similar results was demonstrated by **Musieba et al. (2012)** and **Maio et al. (2003)** in *Pleurotus ostreatus*.

5.1.8. Days to pin head initiation to first harvest, second harvest and third harvest

The treatment showed that the significantly minimum days to pin head initiation to first harvest (3.00 days), second harvest (10.83 days) and third harvest (18.33 days) was recorded with wheat straw 80% along with paddy straw 20%. The result showed that minimum number of days from appearance of pinheads to the maturity of pinheads was taken on the wheat straw followed by paddy straw. Similar findings also be noted by **Khan *et al.* (1981)**, **Khanna and Garcha (1981)** and **Tan (1981)**.

5.1.9. Number of sporophore

Significantly maximum pooled number of sporophore (97.17) was recorded with wheat straw 80% along with paddy straw 20%. It might be due to the compactness of substrates and effective colonization. Similar results have been reported by **Stamets (2005)** and **Thakur *et al.* (2001)**.

5.1.10. Weight of sporophore per bunch (g)

The treatment showed that the significantly maximum pooled weight of sporophore per bunch (41.90 g) was recorded with wheat straw 80% along with paddy straw 20%. Similar trend also reported in **Kumari and Achal (2008)**.

5.1.12. Number of pinheads

Significantly maximum pooled number of pinheads (169.50) was recorded with wheat straw 80% along with paddy straw 20%. Characteristics feature of fast mycelial growth leads to the dense outgrowth on combination of substrate. Similar findings are in concurrence by **Josephine, 2014** and **Yang *et al.* (2014)**.

5.1.13. Number of effective fruiting bodies

The treatment showed that the significantly maximum pooled weight of sporophore per bunch (32.17) was recorded with wheat straw 80% along with paddy straw 20%. The findings are in conformity of **Quimio (1978)**.

5.1.14. Number of primordia

Significantly maximum pooled number of pinheads (169.50) was recorded with wheat straw 80% along with paddy straw 20%. It might be due to the formation of mycelia, wheat straw decrease carbon content and increases nitrogen and oxygen ratio leads to preferential degradation for specific polysaccharides than others. The results were in concurrence with the findings of **Shah et al. (2004) and Locci et al. (2008)** in *Pleurotus ostreatus*.

5.1.15. Substrates Spawn run (days)

Significantly minimum days to substrate spawn running days were recorded with wheat straw 80% along with paddy straw 20%. On the basis on analyzing the available data, trends showed that the combination of wheat straw and paddy straw effectively decrease the spawn run days and purity and quality of spawn. It might be due to the partial breakdown of hemicellulose, cellulose in presence of enzymes. It were readily available to competitors. Similar results reported by **Bhatti et al. (1987)** and **Balasubramanya and Kathe (1996)**.

5.2. Effect of different treatment combinations on yield attributes

Significantly higher total yield and yield of subsequent days in first, second and third harvest clearly showed that wheat straw 80% along with paddy straw 20%. The yield of sporophores was related positively with cellulose content and negatively with the substrates. The present finding indicates that highest yield was obtained in wheat straw followed by rice straw. It might be due to the positive correlation with cellulose availability. Sometimes, It showed negative effects as lignin and ortho-dihydroxy phenolics content of substrate composition. **Peksen and Yakupoglu (2009)** reported that positive correlation among yield, nitrogen content and biological efficiency of substrate. Other scientist recorded similar results as **Bhatti et al. (1987)**, **Zadrazil (1973)** observed two flushes, **Ramzan (1982)** obtained 3-5 flushes, **Sivaprakasam et al. (1987)**, **Ragunathan et al. (1996)**, **Kumar et al. (1997)** and **Bhandari et al. (1991)**.

5.2.1. Biological efficiency

The treatment indicated that the significantly maximum biological efficiency was recorded with wheat straw 80% along with paddy straw 20%. It has been observed that variation in biological efficiency varies as per substrate that has been utilized. It might be due to the environmental factors, physiological activity, controlled and semi-controlled conditions, for example, constant humidity, light and temperature regulation. It also depends on fungal species, availability of spawn, spawning rate and their combined effect. Similar results have been noted as **Jiskani et al. (1999)**, **Bughio (2001)**, **Graham and Clyde (1985)**, **Kausar and Iqbal (1994)**, **Moonmoon et al. (2010)** in *Pleurotus eryngii* and **Nunez and Mendoza (2002)** in *Pleurotus ostreatus*.

5.3. Effect of different treatment combinations on nutritional composition attributes

5.3.1. Moisture content (%)

Significantly lower moisture content clearly showed that wheat straw 80% along with paddy straw 20%. Moisture content of the materials depends on the pores and holes or hollow fine channels present in the leaves and stems of the substrates. Moisture percentage in mushroom depends on the maturity of fruiting bodies, species and storage conditions during packaging or processing. Material with superior quality of lignin and cellulose contents take a longer time to initiate the pinning compared to the substrate with low content of lignin and cellulose. Similar findings reported by **Patra and Pani (1995)**.

5.3.2. Dry Content (%)

The treatment indicated that the significantly maximum dry content (15.33 %) was recorded with wheat straw 80% along with paddy straw 20%. Similar findings are in concurrence by **Jahangir et al. (2015)**.

5.3.3. Acidity Content (%)

The treatment indicated that the significantly minimum acidity content (0.036%) was recorded with wheat straw 80% along with paddy straw 20%. Similar

findings have been observed by **Jahangir et al. (2015)**, **Salazar (2011)** and **Fanadzo et al., (2010)**.

5.3.4. Total soluble solids (⁰Brix)

The treatment indicated that the significantly minimum total soluble solids (3.03⁰B) were recorded with wheat straw 80% along with paddy straw 20%. Similar findings are in concurrence by **Jahangir et al. (2015)** and **Barros et al. (2007)**.

5.3.5. pH content

The treatment indicated that the significantly maximum pHcontent (7.4) was recorded with wheat straw 80% along with paddy straw 20%. It has been observed that availability of nitrogen content in substrate correlated with longer Ph range. It might be due to the high fiber content along with carbon nitrogen ratio encourage digestibility of lignin and cellulosic material caused to bounded form of nitrogen leads to delayed in developing mushroom mycelia. It has been estimated as that mushrooms have this ability to absorb and fix atmospheric nitrogen so, their nitrogen need discrepancy would be compensated. Similar findings are in concurrence with **Fanadzo et al. (2010)** and **Bisaira et al. (1987)**.

5.3.3. Ascorbic acid (mg/100 gram)

Significantly lower ascorbic acid content (12.77 mg/100 gram) clearly showed that wheat straw 80% along with paddy straw 20%. Similar findings was noted by **Bano (1976)**, **Chang et al. (1981)**, **Caglairmak (2007)** and **Alam et al. (2007)**.

5.3.4. Total sugars (mg/100 gram)

The treatment indicated that the significantly minimum total sugars (35.10 mg/100 gram) were observed with wheat straw 80% along with paddy straw 20%. These results are confirmed with the findings of **Patil et al. (2008)**

5.3.5. Protein content (mg/100 gram)

The treatment indicated that the significantly maximum pooled protein content (25.08) was recorded with wheat straw 80% along with paddy straw 20%. It has been reported that high protein content in mushroom might be due to the decomposition of

total carbohydrate, cellulose, hemicellulose and fiber content during inoculation stage. The results showed that protein content positively correlated with maturity of fruiting bodies. Similar findings also have been reported by **Patil et al. (2010)** **Banik and Nandi (2004)** and **Shashirekha et al. (2005)**.

5.4. Benefit : cost ratio

The overall benefit cost ratio of year during 2019 and 2020. The benefit cost ratio 1.72 : 1 in both year. Similar findings reported by **Pant et al. (2012)** **Mutuku, (2005)**, **Khare et al. (2015)** and **Singh et al. (2010)**.

Summary and Conclusion

The experiment of the present investigation entitled “Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) under sub-tropical conditions” was carried out from October 2019 to December 2019 and October 2020 to December 2020 in the research laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Rae Bareilly Road, Lucknow, 226 025 (U.P.) with the following objectives.

The data were subjected to statistical analysis. The salient findings of the present investigation are summarized as below.

1. To find out the effect of different agro waste as substrates for growth of the oyster mushroom.
2. To assess the nutritional quality of the oyster mushroom grown on different substrates.
3. To investigate the best substrate for the cultivation of oyster mushroom under sub-tropical conditions.
4. To evaluate the influence of different substrates on biological efficiency of oyster mushroom.
5. To estimate the benefit: cost ratio of oyster mushroom production.

1. **Length of stipe (cm):** The maximum of the length of stipe was observed in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum the length of stipe was recorded under the treatment T₂ (Paddy straw 100%).
2. **Diameter of stipe (cm):** The maximum diameter of stipe was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum diameter of stipe was recorded under the treatment T₂ (Paddy straw 100%).
3. **Diameter of pileus (cm):** The maximum diameter of pileus was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum diameter of pileus was recorded under the treatment T₂ (Paddy straw 100%).

4. **Diameter of fruiting bodies (cm):** The maximum diameter of fruiting bodies was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum diameter of fruiting bodies was recorded under the treatment T₂ (Paddy straw 100%).
5. **Primordial initiation days:** The minimum days to primordial initiation was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum days to primordial initiation was recorded under the treatment T₂ (Paddy straw 100%).
6. **Pinhead formation days:** The minimum days to pinhead formation was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum days to pinhead formation was recorded under the treatment T₂ (Paddy straw 100%).
7. **Maturity time of sporophore:** The minimum maturity time of sporophore was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum maturity time of sporophore was recorded under the treatment T₂ (Paddy straw 100%).
8. **Days to pin head initiation to first harvest:** The minimum days to pin head initiation to first harvest was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum days to pin head initiation to first harvest was recorded under the treatment T₂ (Paddy straw 100%).
9. **Days to pin head initiation to second harvest:** The minimum days to pin head initiation to second harvest was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum days to pin head initiation to second harvest was recorded under the treatment T₂ (Paddy straw 100%).
10. **Days to pin head initiation to third harvest:** The minimum days to pin head initiation to third harvest was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum days to pin head initiation to third harvest was recorded under the treatment T₂ (Paddy straw 100%).
11. **Number of sporophore:** The maximum number of sporophore was recorded under the treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum number of sporophore was recorded under the treatment T₂ (Paddy straw 100%).
12. **Weight of sporophore per bunch (g):** The maximum weight of sporophore per bunch was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%)

whereas, minimum weight of sporophore per bunch was recorded under the treatment T₂ (Paddy straw 100%).

- 13. Number of pinhead:** The maximum number of pinhead was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum number of pinhead was recorded under the treatment T₂ (Paddy straw 100%).
- 14. Number of effective fruiting bodies:** The maximum number of effective fruiting bodies was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum number of effective fruiting bodies was recorded under the treatment T₂ (Paddy straw 100%).
- 15. Number of primordia:** The maximum number of primordia was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum number of primordia was recorded under the treatment T₂ (Paddy straw 100%).
- 16. Substrate spawn run (days):** The minimum days to substrate spawn run was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum days to substrate spawn run was recorded under the treatment T₂ (Paddy straw 100%).
- 17. Yield of first harvest per bed (g):** The maximum yield of first harvest per bed (g) was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum yield of first harvest per bed (g) was recorded under the treatment T₂ (Paddy straw 100%).
- 18. Yield of second harvest per bed (g):** The maximum yield of second harvest per bed (g) was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum yield of second harvest per bed (g) was recorded under the treatment T₂ (Paddy straw 100%).
- 19. Yield of third harvest per bed (g):** The maximum yield of third harvest per bed (g) was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum yield of third harvest per bed (g) was recorded under the treatment T₂ (Paddy straw 100%).
- 20. Total yield (g):** The maximum total yield (g) was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum total yield was recorded under the treatment T₂ (Paddy straw 100%).
- 21. Biological efficiency (%):** The minimum biological efficiency was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum biological efficiency was recorded under the treatment T₂ (Paddy straw 100%).

- 22. Moisture (%):** The minimum percentage of moisture was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum percentage of moisture was recorded under the treatment T₂ (Paddy straw 100%).
- 23. Dry matter content (%):** The maximum dry matter content was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum dry matter content was recorded under the treatment T₂ (Paddy straw 100%).
- 24. pH content:** The maximum pH content was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum pH content was recorded under the treatment T₂ (Paddy straw 100%).
- 25. Acidity content (%):** The minimum acidity content was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum acidity content was recorded under the treatment T₂ (Paddy straw 100%).
- 26. Total Soluble Solids (⁰B):** The minimum total soluble solids was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum Total soluble solids was recorded under the treatment T₂ (Paddy straw 100%).
- 27. Ascorbic acid (mg/100mg):** The minimum ascorbic acid (mg/100mg) was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum ascorbic acid (mg/100mg) was recorded under the treatment T₂ (Paddy straw 100%).
- 28. Total sugars (mg/100mg):** The minimum total sugars (mg/100mg) was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, maximum total sugars (mg/100mg) was recorded under the treatment T₂ (Paddy straw 100%).
- 29. Protein content (mg/100mg):** The maximum protein content (mg/100mg) was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum protein content (mg/100mg) was recorded under the treatment T₂ (Paddy straw 100%).
- 30. Benefit: cost ratio:** The maximum benefit : cost ratio was recorded in treatment T₆ (Wheat straw 80% + Paddy straw 20%) whereas, minimum maximum benefit : cost ratio was recorded under the treatment T₂ (Paddy straw 100%).
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Conclusion

Considering the various parameters of growth, yield and nutritional composition of oyster mushroom (*Pleurotus florida*) with different ratios of wheat straw and paddy straw. On the basis of experimental findings, it is obvious that wheat straw (80%) along with paddy straw (20%) is more conducive for growth and yield than higher levels. However, yield of treatment wheat straw (80%) along with paddy straw (20%) was equally effective in 85%, 90% and 95% of wheat straw and 15%, 10% and 5% paddy straw, respectively in different days of harvest. It also indicated that one can save up to 20% wheat straw and grow suitably in ratio of paddy straw. Hence, it can be concluded that use of different combinations showed positive attributes and utilization of different substrates in combination. Therefore, oyster mushroom can be grown throughout the year by maintaining the temperature, relative humidity and carbon dioxide level so it was better way to doubling of farmers income and livelihood security of the poor masses. It is evident from the findings that cultivation of *Pleurotus* mushroom is economically viable, technically feasible, and socially acceptable and eco - friendly. Therefore, cultivation practices can be adopted in small level in beginning followed by commercial level in subtropical conditions.

Future thrust

Since, the present experiment was carried out for only two years in confined location. The experiment needs to be repeated to few more locations to get more valid conclusion. Therefore, it may definitely establish a clear graph between availability of raw material and corresponding characters.

Furthermore, some other substrates may also be tested in different combinations to draw a line and possibilities of enhancing growth and yield. Before recommending to farmers, entrepreneur and self help group such trial is required to be repeated and conducted at different parts of Uttar Pradesh for commercial production.

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Appendices

Appendix-I

Analysis of variance (ANOVA) of length of stipe (cm) during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	0.86	0.08	12.88	0.000
Error	24	0.15	0.01	** Sig at 1%	
Total	35	1.01			

Appendix-II

Analysis of variance (ANOVA) of length of stipe (cm) during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	0.27	0.02	6.35	0.000
Error	24	0.09	0.00	** Sig at 1%	
Total	35	0.36			

Appendix-III

Analysis of variance (ANOVA) of pooled data of length of stipe (cm) during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	1.01	0.09	14.08	0.000
Error	60	0.39	0.01	** Sig at 1%	
Total	71	1.40			

Appendix-IV

Analysis of variance (ANOVA) of diameter of stipe (cm) during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	0.61	0.06	11.62	0.000
Error	24	0.12	0.00	** Sig at 1%	
Total	35	0.73			

Appendix-V

Analysis of variance (ANOVA) of diameter of stipe (cm) during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	0.75	0.07	18.53	0.000
Error	24	0.09	0.00	** Sig at 1%	
Total	35	0.84			

Appendix-VI

Analysis of variance (ANOVA) of pooled data of diameter of stipe (cm) during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	1.33	0.12	29.70	0.000
Error	60	0.24	0.00	** Sig at 1%	
Total	71	1.57			

Appendix-VII

Analysis of variance (ANOVA) of diameter of pileus (cm) during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	4.42	0.40	11.62	0.000
Error	24	0.83	0.03	** Sig at 1%	
Total	35	5.25			

Appendix-VIII

Analysis of variance (ANOVA) of diameter of pileus (cm) during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	2.79	0.25	5.98	0.000
Error	24	1.02	0.04	** Sig at 1%	
Total	35	3.81			

Appendix-IX

Analysis of variance (ANOVA) of pooled data of diameter of pileus (cm) during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	6.94	0.63	17.83	0.000
Error	60	2.12	0.04	** Sig at 1%	
Total	71	9.06			

Appendix- X

Analysis of variance (ANOVA) of diameter of fruiting bodies (cm) during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	62.55	5.69	135.56	0.000
Error	24	1.01	0.04	** Sig at 1%	
Total	35	63.55			

Appendix- XI

Analysis of variance (ANOVA) of diameter of fruiting bodies (cm) during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	63.16	5.74	81.06	0.000
Error	24	1.70	0.07	** Sig at 1%	
Total	35	64.86			

Appendix-XII

Analysis of variance (ANOVA) of pooled data of diameter of fruiting bodies (cm) during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	125.47	11.41	162.18	0.000
Error	60	4.22	0.07	** Sig at 1%	
Total	71	129.69			

Appendix- XIII

Analysis of variance (ANOVA) of primordial initiation days during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	52.31	4.76	8.15	0.000
Error	24	14.00	0.58	** Sig at 1%	
Total	35	66.31			

Appendix- XIV

Analysis of variance (ANOVA) of primordial initiation days during year 2020

source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	56.08	5.10	4.59	0.001
Error	24	26.67	1.11	** Sig at 1%	
Total	35	82.75			

Appendix- XV

Analysis of variance (ANOVA) of pooled data of diameter of fruiting bodies (cm) during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	107.44	9.77	13.22	0.000
Error	60	44.33	0.74	** Sig at 1%	
Total	71	151.78			

Appendix- XVI

Analysis of variance (ANOVA) of pinhead formation days during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	67.22	6.11	4.49	0.001
Error	24	32.67	1.36	** Sig at 1%	
Total	35	99.89			

Appendix- XVII

Analysis of variance (ANOVA) of pinhead formation days during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	41.00	3.73	3.73	0.003
Error	24	24.00	1.00	** Sig at 1%	
Total	35	65.00			

Appendix- XVIII

Analysis of variance (ANOVA) of pooled data of pinhead formation days during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	73.11	6.65	3.36	0.001
Error	60	118.67	1.98	** Sig at 1%	
Total	71	191.78			

Appendix- XIX

Analysis of variance (ANOVA) of maturity time of sporophores during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	23.64	2.15	4.07	0.002
Error	24	12.67	0.53	** Sig at 1%	
Total	35	36.31			

Appendix- XX

Analysis of variance (ANOVA) of maturity time of sporophores during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	46.97	4.27	6.15	0.000
Error	24	16.67	0.69	** Sig at 1%	
Total	35	63.64			

Appendix- XXI

Analysis of variance (ANOVA) of pooled data of maturity time of sporophores during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	66.33	6.03	7.28	0.000
Error	60	49.67	0.83	** Sig at 1%	
Total	71	116.00			

Appendix- XXII

Analysis of variance (ANOVA) of days required pinhead initiation to first harvest during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	11.22	1.02	2.45	0.032
Error	24	10.00	0.42	* Sig at 5%	
Total	35	21.22			

Appendix- XXIII

Analysis of variance (ANOVA) of days required pinhead initiation to first harvest during year 2020

source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	18.97	1.72	3.45	0.005
Error	24	12.00	0.50	** Sig at 1%	
Total	35	30.97			

Appendix- XXIV

Analysis of variance (ANOVA) of pooled data of days required pinhead initiation to first harvest during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	26.15	2.38	5.25	0.000
Error	60	27.17	0.45	** Sig at 1%	
Total	71	53.32			

Appendix- XXV

Analysis of variance (ANOVA) of days required pinhead initiation to second harvest during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	28.56	2.60	2.83	0.016
Error	24	22.00	0.92	* Sig at 5%	
Total	35	50.56			

Appendix- XXVI

Analysis of variance (ANOVA) of days required pinhead initiation to second harvest during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	32.97	3.00	2.63	0.023
Error	24	27.33	1.14	* Sig at 5%	
Total	35	60.31			

Appendix- XXVII

Analysis of variance (ANOVA) of pooled data of days required pinhead initiation to second harvest during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	61.04	5.55	6.18	0.000
Error	60	53.83	0.90	** Sig at 1%	
Total	71	114.88			

Appendix- XXVIII

Analysis of variance (ANOVA) of days required pinhead initiation to third harvest during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	47.67	4.33	3.80	0.003
Error	24	27.33	1.14	** Sig at 1%	
Total	35	75.00			

Appendix- XXIX

Analysis of variance (ANOVA) of days required pinhead initiation to third harvest during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	48.31	4.39	3.68	0.004
Error	24	28.67	1.19	** Sig at 1%	
Total	35	76.97			

Appendix- XXX

Analysis of variance (ANOVA) of pooled data of days required pinhead initiation to third harvest during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	94.82	8.62	8.94	0.000
Error	60	57.83	0.96	** Sig at 1%	
Total	71	152.65			

Appendix- XXXI

Analysis of variance (ANOVA) number of sporophores of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	397.53	36.14	38.24	0.000
Error	24	22.68	0.95	** Sig at 1%	
Total	35	420.21			

Appendix- XXXII

Analysis of variance (ANOVA) number of sporophores of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	466.63	42.42	93.81	0.000
Error	24	10.85	0.45	** Sig at 1%	
Total	35	477.49			

Appendix- XXXIII

Analysis of variance (ANOVA) of pooled data of number of sporophores during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	858.90	78.08	78.33	0.000
Error	60	59.81	1.00	** Sig at 1%	
Total	71	918.72			

Appendix- XXXIV

Analysis of variance (ANOVA) weight of sporophores per bed of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	397.53	36.14	38.24	0.000
Error	24	22.68	0.95	** Sig at 1%	
Total	35	420.21			

Appendix- XXXV

Analysis of variance (ANOVA) weight of sporophores per bed of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	466.63	42.42	93.81	0.000
Error	24	10.85	0.45	** Sig at 1%	
Total	35	477.49			

Appendix- XXXVI

Analysis of variance (ANOVA) of pooled data of weight of sporophores per bed during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	858.90	78.08	78.33	0.000
Error	60	59.81	1.00	** Sig at 1%	
Total	71	918.72			

Appendix- XXXVII

Analysis of variance (ANOVA) number of pin heads of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	807.64	73.42	11.54	0.000
Error	24	152.67	6.36	** Sig at 1%	
Total	35	960.31			

Appendix- XXXVIII

Analysis of variance (ANOVA) number of pin heads of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	850.56	77.32	7.10	0.000
Error	24	261.33	10.89	** Sig at 1%	
Total	35	1111.89			

Appendix- XXXIX

Analysis of variance (ANOVA) of pooled data of number of pin heads during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	1631.49	148.32	16.30	0.000
Error	60	545.83	9.10	** Sig at 1%	
Total	71	2177.32			

Appendix- XL

Analysis of variance (ANOVA) number of fruiting bodies of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	154.97	14.09	9.39	0.000
Error	24	36.00	1.50	** Sig at 1%	
Total	35	190.97			

Appendix- XLI

Analysis of variance (ANOVA) number of fruiting bodies of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	376.56	34.23	15.60	0.000
Error	24	52.67	2.19	** Sig at 1%	
Total	35	429.22			

Appendix- XLII

Analysis of variance (ANOVA) of pooled data of number of fruiting bodies during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	503.49	45.77	13.21	0.000
Error	60	207.83	3.46	** Sig at 1%	
Total	71	711.32			

Appendix- XLIII

Analysis of variance (ANOVA) number of primordia of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	880.31	80.03	5.48	0.000
Error	24	350.67	14.61	** Sig at 1%	
Total	35	1230.97			

Appendix- XLIV

Analysis of variance (ANOVA) number of primordia of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	841.67	76.52	8.94	0.000
Error	24	205.33	8.56	** Sig at 1%	
Total	35	1047.00			

Appendix- XLV

Analysis of variance (ANOVA) of pooled data of number of primordia during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	1715.49	155.95	15.06	0.000
Error	60	621.17	10.35	** Sig at 1%	
Total	71	2336.65			

Appendix- XLVI

Analysis of variance (ANOVA) substrates spawn run (days) of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	36.22	3.29	3.70	0.004
Error	24	21.33	0.89	** Sig at 1%	
Total	35	57.56			

Appendix- XLVII

Analysis of variance (ANOVA) substrates spawn run (days) of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	32.31	2.94	3.11	0.010
Error	24	22.67	0.94	** Sig at 1%	
Total	35	54.97			

Appendix- XLVIII

Analysis of variance (ANOVA) of pooled data of substrates spawn run (days) during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	67.71	6.16	8.18	0.000
Error	60	45.17	0.75	** Sig at 1%	
Total	71	112.88			

Appendix- XLIX

Analysis of variance (ANOVA) yield first harvest per bed of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	10935.67	994.15	10.56	0.000
Error	24	2260.01	94.17	** Sig at 1%	
Total	35	13195.69			

Appendix- L

Analysis of variance (ANOVA) yield first harvest per bed of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	13466.38	1224.22	27.20	0.000
Error	24	1080.19	45.01	** Sig at 1%	
Total	35	14546.57			

Appendix- LI

Analysis of variance (ANOVA) of pooled data of yield first harvest per bed during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	23773.71	2161.25	30.05	0.000
Error	60	4314.82	71.91	** Sig at 1%	
Total	71	28088.54			

Appendix- LII

Analysis of variance (ANOVA) yield second harvest per bed of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	7898.31	718.03	13.48	0.000
Error	24	1278.25	53.26	** Sig at 1%	
Total	35	9176.56			

Appendix- LIII

Analysis of variance (ANOVA) yield second harvest per bed of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	4043.33	367.58	9.56	0.000
Error	24	922.67	38.44	** Sig at 1%	
Total	35	4966.00			

Appendix- LIV

Analysis of variance (ANOVA) of pooled data of yield second harvest per bed during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	11560.49	1050.95	14.42	0.000
Error	60	4372.09	72.87	** Sig at 1%	
Total	71	15932.57			

Appendix- LV

Analysis of variance (ANOVA) yield third harvest per bed of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	970.57	88.23	9.11	0.000
Error	24	232.37	9.68	** Sig at 1%	
Total	35	1202.94			

Appendix- LVI

Analysis of variance (ANOVA) yield third harvest per bed of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	821.73	74.70	5.09	0.000
Error	24	352.19	14.67	** Sig at 1%	
Total	35	1173.92			

Appendix- LVII

Analysis of variance (ANOVA) of pooled data of yield third harvest per bed during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	1774.66	161.33	13.75	0.000
Error	60	703.97	11.73	** Sig at 1%	
Total	71	2478.64			

Appendix- LVIII

Analysis of variance (ANOVA) total yield (g) of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	5538.91	503.54	3.35	0.006
Error	24	3602.37	150.10	** Sig at 1%	
Total	35	9141.28			

Appendix- LIX

Analysis of variance (ANOVA) total yield (g) of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	4926.55	447.87	2.80	0.017
Error	24	3838.07	159.92	* Sig at 5%	
Total	35	8764.63			

Appendix- LX

Analysis of variance (ANOVA) of pooled data of total yield during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	10344.28	940.39	6.26	0.000
Error	60	9012.43	150.21	** Sig at 1%	
Total	71	19356.71			

Appendix- LXI

Analysis of variance (ANOVA) biological efficiency of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	155.64	14.15	14.98	0.000
Error	24	22.67	0.94	** Sig at 1%	
Total	35	178.31			

Appendix- LXII

Analysis of variance (ANOVA) biological efficiency of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	92.75	8.43	4.40	0.001
Error	24	46.00	1.92	** Sig at 1%	
Total	35	138.75			

Appendix- LXIII

Analysis of variance (ANOVA) of pooled data of biological efficiency during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	240.78	21.89	16.91	0.000
Error	60	77.67	1.29	** Sig at 1%	
Total	71	318.44			

Appendix- LXIV

Analysis of variance (ANOVA) moisture content of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	113.56	10.32	5.31	0.000
Error	24	46.67	1.94	** Sig at 1%	
Total	35	160.22			

Appendix- LXV

Analysis of variance (ANOVA) moisture content of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	72.56	6.60	4.09	0.002
Error	24	38.67	1.61	** Sig at 1%	
Total	35	111.22			

Appendix- LXVI

Analysis of variance (ANOVA) of pooled data of moisture content during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	182.28	16.57	10.61	0.000
Error	60	93.67	1.56	** Sig at 1%	
Total	71	275.94			

Appendix- LXVII

Analysis of variance (ANOVA) dry content of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	113.56	10.32	5.31	0.000
Error	24	46.67	1.94	** Sig at 1%	
Total	35	160.22			

Appendix- LXVIII

Analysis of variance (ANOVA) dry content of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	72.56	6.60	4.09	0.002
Error	24	38.67	1.61	** Sig at 1%	
Total	35	111.22			

Appendix- LXIX

Analysis of variance (ANOVA) of pooled data of dry content during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	182.28	16.57	10.61	0.000
Error	60	93.67	1.56	** Sig at 1%	
Total	71	275.94			

Appendix- LXX

Analysis of variance (ANOVA) pH content of during year

2019 Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	2.71	0.25	18.25	0.000
Error	24	0.32	0.01	** Sig at 1%	
Total	35	3.03			

Appendix- LXXI

Analysis of variance (ANOVA) pH content of during year

2020 Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	3.65	0.33	17.02	0.000
Error	24	0.47	0.02	** Sig at 1%	
Total	35	4.11			

Appendix- LXXII

Analysis of variance (ANOVA) of pooled data of Ph content during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	6.30	0.57	40.41	0.000
Error	60	0.85	0.01	** Sig at 1%	
Total	71	7.15			

Appendix- LXXIII

Analysis of variance (ANOVA) acidity content of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	0.00	0.00	7.53	0.000
Error	24	0.00	0.00	** Sig at 1%	
Total	35	0.00			

Appendix- LXXIV

Analysis of variance (ANOVA) acidity content of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	0.00	0.00	4.85	0.001
Error	24	0.00	0.00	** Sig at 1%	
Total	35	0.00			

Appendix- LXXV

Analysis of variance (ANOVA) of pooled data of acidity content during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	0.00	0.00	14.03	0.000
Error	60	0.00	0.00	** Sig at 1%	
Total	71	0.01			

Appendix- LXXVI

Analysis of variance (ANOVA) total soluble solids of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	2.78	0.25	33.83	0.000
Error	24	0.18	0.01	** Sig at 1%	
Total	35	2.96			

Appendix- LXXVII

Analysis of variance (ANOVA) total soluble solids of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	2.79	0.25	33.39	0.000
Error	24	0.18	0.01	** Sig at 1%	
Total	35	2.98			

Appendix- LXXVIII

Analysis of variance (ANOVA) of pooled data of total soluble solids during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	5.57	0.51	83.17	0.000
Error	60	0.37	0.01	** Sig at 1%	
Total	71	5.94			

Appendix- LXXIX

Analysis of variance (ANOVA) ascorbic acids (%) of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	84.81	7.71	48.69	0.000
Error	24	3.80	0.16	** Sig at 1%	
Total	35	88.61			

Appendix- LXXX

Analysis of variance (ANOVA) ascorbic acids (%) of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	85.67	7.79	51.92	0.000
Error	24	3.60	0.15	** Sig at 1%	
Total	35	89.27			

Appendix- LXXXI

Analysis of variance (ANOVA) of pooled data of ascorbic acid (%) during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	170.39	15.49	118.95	0.000
Error	60	7.81	0.13	** Sig at 1%	
Total	71	178.20			

Appendix- LXXXII

Analysis of variance (ANOVA) total sugars of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	468.50	42.59	100.87	0.000
Error	24	10.13	0.42	** Sig at 1%	
Total	35	478.64			

Appendix- LXXXIII

Analysis of variance (ANOVA) total sugars of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	525.57	47.78	202.60	0.000
Error	24	5.66	0.24	** Sig at 1%	
Total	35	531.23			

Appendix- LXXXIV

Analysis of variance (ANOVA) of pooled data of total sugars during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	986.26	89.66	227.29	0.000
Error	60	23.67	0.39	** Sig at 1%	
Total	71	1009.93			

Appendix- LXXXV

Analysis of variance (ANOVA) protein content of during year 2019

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	61.14	5.56	32.48	0.000
Error	24	4.11	0.17	** Sig at 1%	
Total	35	65.25			

Appendix- LXXXVI

Analysis of variance (ANOVA) protein content of during year 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	56.67	5.15	16.98	0.000
Error	24	7.28	0.30	** Sig at 1%	
Total	35	63.95			

Appendix- LXXXVII

Analysis of variance (ANOVA) of pooled data of protein content during year 2019 and 2020

Source of variation	DF	Sum of Squares	Mean Squares	F- Calculated	Significance
Treatment	11	116.49	10.59	49.68	0.000
Error	60	12.79	0.21	** Sig at 1%	
Total	71	129.29			