Studies on off-season production of onion (*Allium cepa* L.) cv. Agrifound Dark Red

SUMMARY

SUBMITTED TO THE
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
(A CENTRAL UNIVERSITY)
LUCKNOW

FOR THE AWARD OF THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

HORTICULTURE

Supervisor
Dr. Sutanu Maji
Associate Professor

Submitted By
Maya Ram
Enroll. No. 955/19

DEPARTMENT OF HORTICULTURE
SCHOOL OF AGRICULTURAL SCIENCES & TECHNOLOGY
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY (NAAC A^{++} Accredited)
(A Central University)
Vidya Vihar, Rae Bareli Road, Lucknow-226025
(U.P.), India

2024

SUMMARY

In the present investigation with two experiment seed of onion were sown in two different nurseries (open condition and protected condition). But, open condition onion nursery have poor vegetative growth, high morality level due to unfavorable growing condition viz., high rainfall and sun scorching while, protected condition (low cost tunnel) onion seedling exhibited vigorous seedling growth due to existence of micro-climate around the plant. However, protected condition is advised for seedling growing during rainy season. On the basis of seedling growth characters (germination, seedling height, number of leaves per seedling, leaf length, root characters, shoot: root of onion seedlings etc.) seed sowing on 10th March (D_2) may be considered for off season onion production for summer followed by August seed sowing for post *kharif* onion production.

It is also clear from the present experiment that year round production of onion is possible. It was noticed that maximum values for vegetative growth and yield contributing traits (plant height, number of leaves/plant, leaf length, neck thickness, average bulb weight, bulb yield), as well as bulb physical quality parameters (length of bulb, polar diameter, equatorial diameter, volume of bulb, dry matter content, number of scale) were observed when plants were transplanted on 1st October (D_7). Chemical quality parameters namely total soluble solids, total sugars, reducing sugar, non -reducing sugar, ascorbic acid, acidity were found to be superior in raised bed when transplanted on 1st October (D_7 x B_1). While, maximum sulphur content was estimated when raised bed was transplanted on 1st October (D_7 x B_1). It was clear that all the types of bed produced higher yield when transplanted on 1st October which exhibited maximum income and high B: C ratio. Therefore, it can be concluded that raised bed transplanting on 1st October can be suggested for off-season onion production for bulb growth, yield and getting more profit.

The present investigation entitled, "**Studies on off-season production of onion *(Allium cepa* L.) cv. Agrifound Dark Red"** was carried out at Horticulture Research Farm-Iof the Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya Vihar, Rae Bareli Road, Lucknow during 2021-22 and 2022-23. The result was discussed in the last

chapter in light of literature available and research work reported by earlier workers on onion and related. The experimental findings are now summarized and presented.

Experiment-I: Standardization of time of seed sowing and type of nursery for raising seedlings for off-season onion production.

- The maximum germination percentage was recorded under the summer seed sowing date of March (D_2 x B_2) on protected bed followed by seed sowing date D_3 x B_2 (April) and D_4 x B_2 (May) while, the minimum germination percent was recorded under the post monsoon and winter season seed sowing date D_8 x B_1 on open bed (September).
- Germination delayed in September sowing which took maximum days to start germination (D_8 x B_1) on open bed followed by seed sowing date D_6 x B_1 (July) and D_5 x B_1 (June). The minimum days i.e. early germination (days) was recorded under the summer season seed sowing date D_1 x B_2 on protected bed (February) during the both years.
- Maximum days to complete germination from starting of germination was recorded under sowing date of D_8 x B_1 on open bed (September), followed by seed sowing date D_9 x B_1 (October) and D_2 x B_1 (April). Minimum days for completion of germination (days) was observed under the seed sowing date D_4x B_2 on protected bed (May).
- Seedling height at the time of transplanting was recorded under the summer seed sowing date D_2 x B_2 on protected bed, followed by seed sowing date D_4 x B_2 (May) and D_7 x B_2 (August). While, the minimum seedling height was recorded under the monsoon and post monsoon and winter seed sowing date D_8 x B_1 on open bed (September).
- Seed sowing during March (D_2 x B_2) on protected bed also produced maximum number of leaves, followed by seed sowing date D_1 x B_2 (February) and D_3 x B_2 (April) while, the minimum number of leaves per seedling was recorded under the September sowing (D_8 x B_1) on open bed.
- March sowing (D_2) also recorded the highest leaf length followed by seed sowing date D_1 x B_2 on protected bed followed by D_4 x B_2 (May) and D_5 x B_1 (June). While, the minimum length of leaves was measured during September seed sowing (D_8 x B_1) on open bed.

- Maximum length of roots of seedlings was noted under the seed sowing date D_2x B_2 on protected bed (March), followed by D_3 x B_2 (April) and D_4 x B_2 (May) seed sowing. Minimum length of roots of seedling was recorded under the post monsoon and winter seed sowing date of D_8 x B_1 on open bed (September) during the both years.
- Maximum number of roots per plant of onion was also recorded under the summer seed sowing date D_2 x B_2 on protected bed. It was followed by seed sowing date D_4x B_2 (May) and D_3x B_2 (April) while, the minimum number of roots per seedling was recorded under the post monsoon and winter seed sowing date D_8 x B_1 on open bed.
- Basal diameter of onion seedlings at the time of transplanting was found maximum under summer seed sowing date D_2 x B_2 on protected bed (March), followed by seed sowing date D_1 x B_2 (February) and D_3 x B_2 (April) while, the minimum basal diameter of seedling was recorded under the post monsoon and winter seed sowing date D_8 x B_1 on open bed was recorded during both the years.
- The shoot: root ratio of onion seedlings was recorded maximum at the time of transplanting under summer seed sowing date of D_4 x B_2 on protected bed (May), followed by seed sowing date D_3 x B_2 (April) and D_1 x B_2 (February) while, the minimum shoot: root of seedling was recorded under the post monsoon and winter seed sowing date (September) D_8 x B_1 on open bed during the both years of investigation.

Experiment-II: Studies on effect of different dates of transplanting and type of bed on vegetative growth, bulb yield and quality of onion cv. Agrifound Dark Red.

- Plant height of transplanted onion seedlings was recorded maximum when transplanting was done during 1st October (D_7 x B_1) on raised bed followed by transplanting date D_8 x B_1 (1st November) and D_9 x B_1 (1st December).
- Onion plants transplanted on 1st October (D_7) produced maximum number of leaves per plant raised bed followed by D_8 (1st November) and D_9 (1st December) during the both years.
- Leaf length was also found maximum in D_7 (1st October) raised bed followed by D_8 (1st November) and D_9 (1st December) whereas, the minimum leaf length was recorded on 1st June transplanting (D_3) flat bed.
- Similarly, maximum neck thickness was observed under treatment D_7 post monsoon and winter season on raised bed, followed by D_9 (1st December) and D_6 (1st September).
- Treatment D_7 x B_1 (1st October) caused maximum bulb yield on raised bed followed by D_8 x B_1 (1st November)), while the minimum bulb yield per plot was estimated when transplanted on 1st June (D_3 x B_2) on raised bed showed higher yield.
- Similar trend was also observed in case of yield per ha also. The harvested onion bulb exhibited higher bulb size in respect of length of bulb, volume of bulb when transplanted on 1st October (D_7) had better bulb size over raised bed. The bulb diameter was also significantly influenced by dates of transplanting and beds. It was observed that both polar and equatorial diameter was recorded maximum under treatment D_7 (1st October).
- Transplanting on D_7 x B_1 (1st October)on raised bed, showed delay in harvesting, However, transplanting on 1st July on D_4x B_2 flat bed caused early harvesting by taking minimum days to harvest.
- Maximum average weight of bulb after short curing 1st October during both the years was obtained in the treatment D_7 x B_1 on raised bed post monsoon and winter season, followed by D_8 (1st November), while minimum average weight of bulb after curing 1st July monsoon was recorded D_4 x B_2 on flat bed.

- The maximum fresh weight of bulb was obtained on transplanting on 1st October (D_7 x B_1) on raised bed, followed by D_9 (1st November) while, minimum value of fresh weight of bulb was recorded on 1st June transplanting on flat bed (D_3 x B_2).
- The maximum dry weight of bulb was estimated with treatment D_7 x B_1 on raised bed, followed by D_8 (1st November), while the minimum dry weight of bulb was recorded with D_3 x B_2 (1st June) on flat bed.
- The maximum volume of bulb was measured on transplanting on 1st October with D_7 x B_1 on raised bed, followed by D_8 x B_1 (1st November), in both year while, the minimum volume of bulb1st July on flat bed was recorded with the D_4 x B_2.
- Maximum specific gravity was calculated when planting was done on 1st October (D_7 x B_1) on raised bed followed by D_8 x B_1 (1st November), while, the minimum specific gravity was recorded with the D_4 x B_2 on flat bed (1st July).
- The maximum dry matter content was recorded with D_7 x B_1 on raised bed followed by D_8 x B_1 (1st November), in both year while, the minimum dry matter content was recorded with the D_3 x B_2 (June) flat bed.
- Maximum number of fresh scales per bulb was counted on plants transplanted on 1st October (D_7 x B_1) on raised bed followed by D_8 x B_1 (1st November). The minimum number of scales was recorded with D_3 x B_2 on flat bed i.e. summer monsoon.
- An increase in TSS in bulb was found with 1st October transplanting of D_7 x B_1 on raised bed followed by D_8 x B_1 (1st November). The minimum total soluble solids were recorded with D_3 x B_2 on flat bed for both the years.
- The maximum total sugars1st October was recorded during both the year with D_7 x B1 on raised bed followed by D_9 x B_1. While, the minimum total sugars was recorded with the D_3 x B_2 on flat bed.
- Similarly, reducing sugar and non-reducing sugar content in bulb was also analysed and found maximum with 1st October transplanting (D_7 x B_1) on raised bed. D_7 x B_1 also had high sugar (reducing and non- reducing) close to D_3 x B_2 on flat bed. It also showed the maximum reducing sugar on 1st October plants was recorded during both the year followed by D_7 x B_1 raised bed.
- Highest acidity was found in early transplanting i. e. D_7 x B_1 on raised bed (1st October), followed by D_2 x B_1 (1st May), while the minimum acidity percentage was recorded with D_3 x B_2 on flat bed both the years.

- The maximum ascorbic acid 1st October was recorded during both the year with D_7 x B_1 on raised bed followed by D_8 x B_1 & D_5 x B_1 (1stNovember and 1st August) while the minimum ascorbic acid was recorded with D_3 x B_2 on flat bed.
- D_7B_1 also increased Sulphur content on (1st October date of transplanting), followed by D_8 x B_1 (1st November). While, the minimum sulphur content was observed D_3 x B_2 on flat bed.
- Regarding economic assessment of onion production, maximum Benefit: cost ratio was recorded with D_7 x B_1 (1st October + raised bed), followed by D_3 x B_1 (1st June + raised bed), while lower B: C ratio was recorded with the D_5 x B_2 (1st August + flat bed).