Genetic Variability, Heritability, Correlation and Path analysis in Cowpea [(*Vigna unguiculata*(L.)Walp.)]

SUMMARY

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THESIS

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1. Introduction

Cowpea *(Vigna unguiculata* (L.) chromosome (2n=22) belongs to the family Leguminosae also known as southern pea and black eye pea, is one of the most important vegetables. It is cultivated for its long, green or purplish pods to be cooked as vegetable or for dry seeds used as pulse. Its foliage is also used as fodder or green manure, producing 20-30 cm long pod and elongated kidney shaped, 8-12 mm long seeds. It is important as a pulse and vegetable crop and enriches soil fertility by fixing atmospheric nitrogen. Cowpeas are of ancient cultivation in Asia and Africa where immense diversity in *V unguiculata* occur.

The subspecies *sesquipedalis* is widespread in the humid tropics of India **(Verdcourt, 1970 ; Purseglove, 1974).** Moreover it will have spill over benefits to their farmlands through, for example, *in situ* decay of root residues, use of animal manures, and ground cover. In addition, because the seed is widely traded out of the major production areas, it provides a cheap and nutritious food for relatively poor urban communities (Singh and Sharma, 1997). There is now a common view that cowpea can play a significant role in farming systems where low inputs including animal fertilizer application can be justified.

Cowpea is commonly cultivated as a nutritious and highly appetizing food source in Asia and throughout the tropics and sub-tropics. Green pod of cowpea contains 85 g moisture, 3.0 g protein, 1.0 g minerals, 2.0 g fiber, 8.0 g carbohydrates, 72 mg calcium, 59 mg phosphorus, 2.0 mg iron, 0.09 mg riboflavin and 0.07 mg thiamin per 100 g of edible portion. **(Anonymous , 2011).**

India has emerged as the second largest producer of vegetables next to only China. Occupying around 3.0% of the total cropped area. The share of India in

vegetable production in the world is about 13.60% with an annual productivity of 15 tonnes per ha. Total vegetable production in the country has been estimated to be about 175.01 million tonnes from an area 10.29 million hectare **(NHB, 2017).** According to ICMR about 300 g vegetables (125g leafy, 100g root and 75g other vegetables) per capita per day is required. But the availability of vegetables in India is only 180g per capita per day, which is very low as compared to the recommended intake.

The climatic requirements of cowpea crop are similar to grain sorghum. On as little as 300 mm rain spread over the growing season, cowpea can produce a yield of up to one-ton seed and six tons of hay **(Claufurd *et al.*, 1996).** It is ideally suited to tropical lowlands, doing well in hot, dry and humid ecosystems **(Nwokolo and Smart, 1996).** Cowpea is thus an important seed crop grown throughout Africa and it is popular among the resource-poor farmers in the Limpopo Province of South Africa. Despite the importance of cowpea in sustaining livelihood of the rural communities, seed yield of the crop has always remained low and variable. Poor production practices including choice of cultivar, adaptability as well as lack of information on the right plant planting date has contributed to low cowpea productivity. There are diverse cowpea genotypes demanding a site specific directed management approach that include, among others, choice of proper planting date, and a selection of best adapted genotypes. With all its different uses and its different advantages, cowpea is a viable and high potential alternative crop. Due to its versatility in yielding high protein and fodder, there is a need to expand production that could be met by growing high yielding varieties **(Delacy *et al.*, 1990).**

2. Research Issues

Cowpeas are grown mostly for their edible beans, although the leaves, green peas and green pea pods can also be consumed, meaning the cowpea can be used as a food source before the dried peas are harvested. Like other legumes, cowpeas are cooked to make them edible, usually by boiling. Cowpeas can be prepared in stews, soups, purees and casseroles, but the most common way to eat them is in curries. They can also be processed into a paste or flour. Chinese long beans can be eaten raw or cooked, but as they easily become waterlogged are usually sautéed, stir-fried, or deep-fried.

A common snack in Africa is Koki or Moyin-Moyin, where the cowpeas are mashed into a paste and then wrapped in banana leaves. They also use the cowpea paste as a supplement in infant formula when weaning babies off milk. Slaves brought to America and the West Indies cooked cowpeas much the same way as they did in Africa, although many people in the American South considered cowpeas not suitable for human consumption. A popular dish was Hoppin' John, which contained black-eyed peas cooked with rice and seasoned with pork. Over time cowpeas became more universally accepted and now Hoppin' John is seen as a traditional Southern dish ritually served on New Year's Day.

cowpea grain contains 23.4 per cent protein, 1.8 per cent fat and 60.3 per cent carbohydrates and it is rich source of calcium and iron (Gupta, 1988). Apart from this, cowpea forms excellent forage and it gives a heavy vegetative growth and covers the ground so well that it checks the soil erosion. As a leguminous crop, it fixes about 70-240kg/ha of nitrogen per annum. Cowpea is mainly

grown in tropical and subtropical regions in the world for vegetable and seed purpose and to lesser extent as a fodder crop **(Rangel *et al*., 2004).**

Health benefits of cowpea

Cowpeas seeds provide a rich source of proteins and calories, as well as minerals and vitamins.This complements the mainly cereal diet in countries that grow cowpeas as a major food crop. A seed can consist of 25% protein and has very low fat content. Cowpea starch is digested more slowly than the starch from cereals, which is more beneficial to human health. The grain is a rich source of folic acid, an important vitamin that helps prevent neural tube defects in unborn babies.

The cowpea has often been referred to as "poor man's meat" due to the high levels of protein found in the seeds and leaves. However, it does contain some anti-nutritional elements, notable phytic acid and protease inhibitors, which reduces the nutritional value of the crop. Although little research has been conducted on the nutritional value of the leaves and immature pods, what is available suggests that the leaves have a similar nutrition value to black night shade and sweet potato leaves, while the green pods have less anti-nutritional factors than the dried seeds.

3. Objectives of the Research Study

The present investigation entitled **"Genetic Variability, Heritability, Correlation and Path analysis in Cowpea [(*Vigna unguiculata* (L.) Walp.)] "**while being under taking with the following objectives:

The objectives of present study are as follows.

1. To find out the genetic variability, heritability and genetic advance of cowpea.
2. To determine genotypic and phenotypic coefficient of variation for different yield and yield attributing traits of cowpea
3. To assess the correlation coefficient and path coefficient analysis among the various traits of cowpea.

4. To ascertain the quality attributing traits of cowpea.

4. Summary of the Thesis

The widest range was recorded for pod yield per plot followed by number of seed per plant, pod weight per plant (g) , number of pod per plant , plant height , days to first open flower and duration of reproductive phases .

Phenotypic coefficient of variation was higher for number of primary branches followed by number of pods per peduncle, peduncle length (cm), pod diameter (cm) , pod length , number of branches per plant and number of pod per plant.

Highest genotypic coefficient of variation was observed in number of primary branched followed by number of pods per peduncle, peduncle length (cm), pod diameter (cm), number of branches per plant, number of seed per plant and pod length (cm).

The highest heritability was recorded for number of primary branches per plant followed number of pods per peduncle, peduncle length (cm), number of seeds per plant, number of branches per plant number of pods per plant, pod diameter (cm) and number of seed per pod .

The maximum genetic advance (%) was recorded for pod yield per plot fallowed by number of seeds per plant, pod weight per plant (g), number of pod per plant, duration of reproductive phase, peduncle length (cm) and number of pods per peduncle.

The correlation coefficient at genotypic level pod yield per plant had positive and significant genotypic correlation coefficient with pod yield per plant followed by number of peduncle per plant . However, negative and

significant correlations were recorded for pod yield per plant with days to first pod picking. Days to first pod picking showed positive and significant correlation followed by number of seeds per pod and negative and significant correlations were recorded for plant height. Number of pods per peduncle fallowed by number of peduncle per plant showed positive and significant correlation and negative and significant correlations were recorded for plant height .

At the phenotypic level pod yield per plant had positive and significant genotypic correlation coefficient followed by number of seeds per pod. However, negative and significant correlations were recorded for vitamin-C. Vitamin-A had positive and significant correlation with pods per peduncle except negative and significant correlation with number of branches per plant , number of primary branches per plant showed positive and significant correlation followed by vitamin-c and negative and significant correlations were recorded for pod diameter**.** Vitamin –C followed by peduncle length showed positive and significant correlation and negative and significant correlations were recorded for number of peduncle per plant.

5. CONCLUSION

On the basis of above result obtained in the present investigation. The experimental materials consisting sixteen genotypes of cowpea i.e. Kashi Unnati, Kashi Shyamal, Kashi Gauri, Kashi Kanchan, Kashi Nidhi, IC-559393, IC-259063, IC-559405, IC-202786, IC-559386, IC-202776, IC-242598, EC-9736, EC-1738, EC-30590 and EC-15296. The maximum phenotypic and genotypic variance, genetic advance was observed for average pod yield per plot. The highest of PCV and GCV was recorded in number of primary branches was estimated. The maximum correlation coefficient at genotype level and phenotypic level was observed for average pod yield per plot. The results of path coefficient for parent are highest positive direct effect towards pod yield per plant was showed by plant height.