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Studies on Genetic Variability in Ridge Gourd (*Luffa acutangula* L. (Roxb.)) Genotypes in Allahabad Agro-Climate Condition

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ABSTRACT

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The investigation was undertaken at Department of Horticulture, SHIATS, Allahabad, during the year 2014. The experiment was laid out in simple Randomized Block Design with 3 replications, 12 genotypes (6 genotypes from IIVR Varanasi and 6 local cultivators) separately. Studies showed that, significant effect on the minimum days to germination (3.53 days), days to first appearance of male and female flower (34.07 and 38.30 days), node number at which first male and female flower appear (5.60 and 11.53), sex ratio (34.00), length of main vine (5.30m), minimum days to first harvesting (43.93 days), fruit length (24.27 cm), fruit weight (132.60 gm), fruit diameter (4.75 cm), fruit yield (60.17t/ha), T.S.S. (4.58 °Brix) and vitamin C (4.59 mg/100gm) was observed maximum in treatment with T₆ RIGVAR-6. The treatment T₆ (RIGVAR-6) was found to be the best out of 12 genotypes in terms of growth, yield, quality and economic returns. The highest B:C ratio (3.86) was found for ridge gourd, in genotypes RIGVAR-6 under the agro-climatic condition of Allahabad.

Introduction

Cucurbits vegetable crops belonging to family cucurbitaceae, which primarily comprised species consumed as food worldwide. The family consists of about 118 genera and 825 species. India is world's largest producer of vegetables next to China with an annual production around 162.187 (Million tonnes) from 92.05 (Million hectare) of land. (Indian Horticulture Database, 2012-2013). This quantity is much less than our requirements and serves capita-1 intake on only 135 g against the recommended requirement of 285g capita-1 day-1 for balance diet. The

vegetable requirement for the country has been estimated 225 million tonnes by 2020. To achieve this target and to provide balanced diet it is necessary to boost up the production of vegetables by increasing area, use of improved technology and by developing and using high yielding varieties and hybrid varieties. *Luffa acutangula* is believed to have originated in India, where wild types still occur, but has now spread pan tropically to all areas with a high rainfall. It is cultivated and locally naturalized in West Africa, from Sierra Leone to Nigeria. It is cultivated from

the coastal areas to the semi-dry savanna, e.g. in Sierra Leone, Côte d'Ivoire, Ghana, Benin and Nigeria. In East Africa ridged gourd is grown on a small scale near the big cities as an exotic vegetable for consumers of Asian origin, and it is also locally cultivated and naturalized in Madagascar, Réunion and Mauritius. In southern and eastern Asia it is a widely cultivated vegetable. *Luffa (Luffa acutangula L. (Roxb.))* commonly called as ridge gourd, loofah vegetable sponge or dish cloth, having diploid chromosome number $2n = 2x = 26$. It is one of the most important cucurbits grown throughout the country and world. It belongs to the family cucurbitaceae which includes about 118 genera and 825 species a number of major and minor cucurbits are cultivated which share about 5.6 per cent of the total vegetable production. They are consumed in various forms i. e., salad (cucumber, gherkins, long melon), sweet (ash gourd, pointed gourd), pickles (gherkins) and deserts (melons). In India, several research institutes and state agriculture universities (SAU's) have utilized a number of cultivated and wild species to develop parental lines, improved varieties and hybrids. About 112 open pollinated varieties of cucurbits have been recommended for cultivation at national and state levels. Among these, 48 improved varieties in 8 major cucurbits have been identified and recommended through all India coordinated vegetable improvement project. Similarly, 26 hybrids and 7 disease resistant varieties of major cucurbits have also been developed. The main goal of research on cucurbitaceous vegetables in India is to improve productivity on sustainable basis through developing biotic and abiotic resistant variety/hybrid coupled with quality attributes. The yield potential of cucurbits could be increased by adopting the standardized agro-techniques and plant protection measures. India being the second largest producer of vegetables in the world next only to china, shares about 15 per cent of

the world output of vegetables from about 3 per cent of total cropped area in the country. The vegetable requirement of our country is estimated to be 220 million tonnes by 2020 (Singh, 2004) this target can best be achieved through use of improved varieties and hybrid technology in combination with superior crop management skills. Substantial increase in productivity appears feasible even with diminishing land and water resources. It is a monoecious and highly cross pollinated crop in which a large amount of variations are observed for most of the economically important traits. Variability found in shape, size and colour of fruits is most conspicuous. It originated in subtropical Asian region particularly India (Kalloo, 1993). Ridge gourd is an annual plant, produces fruits containing a fibrous vascular system having vigorous vines with cylindrical ten angled fruits, deltoid to nearly orbicular leaves exteriorly but acutely pointed at the apex and usually three to seven lobed with dentate margin (Whitaker and davis, 1962). Ridge gourd is monoecious plant with branched tendrils. Flowers are yellow in colour and showy having five petals. The inflorescences of staminate flowers are raceme, while pistillate flowers are solitary and short long pendunculate. Both types flower any occurs in the same leaf axial, fruits are nearly cylindrical, 0.5-1 feet straight or curred, normally with light furrows or stripes but not ribbed. It is commonly grown for its tender fruits for vegetable purpose as well as for sponge of mature fruits which is used for scrubbing of body skin as a bath sponge increased blood circulation and utensils purpose. The tender fruits are rich in vitamin A, vitamin C and iron (Yawalker, 2004) it has certain medicinal uses. The cooked fruits are easily digestible and very appetizing, therefore, it is recommended to the patients suffering from malaria or other seasonal fevers. The ridge gourd (*Luffa acutangula L. (Roxb.)*) is one of the less popular vegetable in

many parts of the world but is commonly grown in china and other Asian countries. Although, it is well known that fruits shape affects the marketability of ridge gourd as a vegetable, characteristics related to market acceptability has not defined their development modes of inheritance as understood. It is therefore, important to select appropriate parent plants and develop the most appropriate strategy in breeding for edible ridge gourd, with the length and circumference of the fruits being two of the important quantitative traits closely related to the exterior quality of ridge gourd. Among 50 domesticated vegetable crops in India, ridge gourd is one of the important fruits vegetable crops, locally known as Toria. It is a popular summer vegetables of India and cultivated widely in home gardens from Terai to high hills during the rainy season. The area under ridge gourd is rather small and only a few plants are grown in home garden for culinary purpose. However, production on a large scale is in practice in Terai. Recently the crop has gained value with semi commercial to commercial production in Terai serving as an important agricultural item for income – generation for farmers at household level. Unfortunately, no official statistics are available for area and production of ridge gourd and until recently no official farmer research has been undertaken. The taken fruit is consumed as a fresh vegetable and the tender shoots are also consumed as green vegetable. The dried vascular system of the fruits is used as a bathroom ridge gourd and is also a raw material for different industries. Monoecious, annual, climbing or trailing herb, with acutely 5-angled stem; tendrils up to 6-ft, hairy. Leaves alternate, simple; stipules absent; petiole up to 15 cm long; blade broadly ovate to kidney shaped in outline, 10 -25 cm x 10 – 25 cm, shallowly palmately 5-7 lobed with broadly triangular to broadly rounded lobes, cordate at base, shallowly sinuate –dentate, pale green,

scabrous, palmately veined. Male inflorescence racemes with 15-35 cm long peduncle. Flowers unisexual, regular, 5-9 cm in diameter; receptacle tube obconic below, expanded above, c. 0.5 cm long lobes triangular, 1-1.5 cm long; petals free, pale yellow; male flowers solitary, on pedicels 2-15 cm long, with inferior, densely pubescent, longitudinally ridge ovary, stigma 3-lobed. Luffa has a compact network of close fibers; its resiliency markets it useful for many products like filters, slipper soles, baskets. When separated from the skin, flesh and seeds, the fiber network can be used as a bathroom sponge. Luffa can be used as packing material, for making crafts, and as filters. Used as a bath sponge it produces a mild glow on the skin. Ridge gourd is preferred for making sponges because its fiber is easier to extract. Industrial use is made of these fibers for making hats. Ridge gourds possess many healing and medicinal properties and are quite useful in asthma, skin diseases and splenic enlargement. Researchers discovered that its regular consumption is helpful for rheumatism, backache, internal hemorrhage, chest pains as well as hemorrhoids. The blood circulation the sponge induces on the skin has been credited as a relief for rheumatic and arthritic suffers. Immature fruits of less-bitter cultivars of *Luffa acutangula* are used as a vegetable. They are cooked or fried and used in soups and sauces. Occasionally, the stem tops with young leaves and flower buds are used as a leafy vegetable. In South-East Asia, ridged gourd is a popular vegetable because of the mildly bitter flavour, the slightly spongy texture and sweet juiciness. Young fruits of sweet cultivars are also eaten raw and small fruits are sometimes pickled. The seeds yield an edible oil that is, however, sometimes bitter and toxic. In some parts of West Africa a leaf extract of ridged gourd is applied on sores caused by guinea worms to kill the parasite. Leaf sap is also used as eyewash to

cure conjunctivitis. The fruits and seeds are used in herbal preparations for the treatment of venereal diseases, particularly gonorrhoea. In Mauritius the seeds are eaten to expel intestinal worms and the leaf juice is applied to skin affections such as eczema. The plant including the seed is insecticidal. Mature fruits when harvested dry are processed into sponges and used for scrubbing the body while bathing or for domestic purposes, such as washing of cooking utensils, and as filters for local drinks such as palm wine. The composition of ridged gourd fruits per 100 g edible portion (tough skin removed, edible portion 62%) is water 94.2g, energy 70kJ (17kcal), protein 0.8g, fat 0.1g, carbohydrate 3.3g, fiber 1.7g, Ca 12mg, P 32mg, Fe 0.3mg, carotene 26µg, thiamin 0.07mg, riboflavin 0.02 mg, niacin 0.4 mg, folate 37µg, ascorbic acid 3 mg. The composition of young *Luffa* leaves per 100 g edible portion is: water 89 g, protein 5.1 g, carbohydrate 4 g, fiber 1.5g, Ca 56mg, Fe 11.5mg, β-carotene 9.2 mg, ascorbic acid 95mg. Ridge gourd is mainly produced as a home garden crop. Thailand exports ridged gourd to Western Europe as a vegetables for the Asian communities. Japan and Brazil are the main exporters of loofah sponges mostly to the United States, but these are mainly from sponge gourd. In west Africa mature fruits of ridged gourd or sponge gourd are sold as sponge in street markets and supermarkets. Besides soil and climate factors the cultivars it is very important in respects of its performance regarding earliness, drought resistance and best quality fruits and seed for further utilization. There is need to intensify the development of high yielding cultivars with multiple resistant to stabilize ridge gourd production. To plan appropriate breeding programme and to evolve high yielding cultivars with resistant to pest and diseases, the plant breeder must possess adequate knowledge on variability, character association pattern, the extent of contribution

of each character to fruit yield and genetic variability. Keeping in view the aforementioned facts, the present experiment entitled “Studies on Genetic variability in ridge gourd (*Luffa acutangula* L.(Roxb.) in Allahabad agro-climate condition” (will be carried out at research Farm of the department of Horticulture, Allahabad School of Agriculture, SHIATS, Allahabad (U.P.) during of the year 2014-2015) with the following objectives. (i) To evaluate the performance of ridge gourd hybrids in term of growth, yield and quality parameters in Allahabad agro climate conditions. (ii) To work out the economics of the treatments.

Materials and Methods

The present investigation “Studies on Genetic variability in ridge gourd (*Luffa acutangula* L.(Roxb.) in Allahabad agro-climate condition” during the rainy season of the year, 2014 at vegetable research farm. Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, (Deemed-to-be- University) (U.P.). The details of materials used, procedures followed and criteria adopted for evaluation of treatment during the course of investigation are presented in this chapter.

Experimental site and Geographical location:-

The experiment will be carried out at the Vegetable Research Farm, Department of Horticulture, is situated at 8 Km away from Allahabad city of a latitude of 25⁰ North and longitude of 81⁰ east and at an altitude of 98 meters above mean sea level (MSL).

Agro climate conditions:- Allahabad is situated in the eastern part of Uttar Pradesh and in the center of north gangetic alluvial plains, on the left side of Holy River the Yamuna and comes under sub-tropical

zones. The average rainfall in this area about 1100 mm per annum, most of which generally occur during rainy season (mid June to mid October).

Environmental conditions during crop season:-During the period of experiment, the rainy season, meteorological observations were recorded during entire growth period of the crop, comprises maximum and minimum temperature, rainfall, relative humidity from the month of August to November 2014 presented in table 3.1 and graphically shown in figure 3.1.

Soil characteristics of the experimental site:-The experimental site is fairly level land with sandy loam soil of uniform fertility status with low clay and high sand percentage. Composition soil sample were

collected at random spots from depth of 0-30 cm and the soil was analyzed for pH, electrical conductivity (EC), organic carbon, available nitrogen, available phosphorus and available potassium are presented in table 3.2.

Experimental materials:-Experimental materials comprised of 12 genotypes of Ridge gourd. 6 genotypes seeds were collected from Indian Institute of Vegetable Research Station, Varanasi, U.P. and rest of collected from local seed Market.

Design and Layout:-The present experiment will be conducted in Randomized Block Design with 12 treatments. The treatments are replicated three times. The details of the layout are as follows -

Crop	Ridge Gourd (<i>Luffa acutangula</i> L.)
Family	Cucurbitaceae
Experiment design	Randomized Block Design (RBD)
Replication	03
Total number of treatments	12
Spacing	0.5m P2P x 1.0 m R2R
Number of plants in each plot	06
Plot size	1.5 m x 2.0m = 3.0sq. m
Width of main irrigation channel	1.0 m
Width of sub irrigation channel	0.5m
Width of bunds	30.0 cm
Gross experimental area	203.67 sq m

Plant growth and Floral Parameters

(1) Days to germination, (2) Days to first appearance of male flower, (3) Days to first appearance of female flower, (4) Node number at which first male flower appear, (5) Node number at which first female flower appear, (6) Sex ratio, (7) Length of main vine (m), (8) Number of branches per vine

Yield Parameters:- (1) Number of fruits per vine, (2) Fruit diameter (cm), (3) Fruit length (cm), (4) Fruit weight (g), (5) Days to first fruit harvest, (6) Fruit yield (kg/vine), (7) Fruit yield (tones /hectare).

Quality Parameters:- (1) Total soluble solid (0 Brix), (2) Vitamin ‘C’ mg/100g

Technique of study:-The method of recording the observation was as follows:-

Growth and floral parameters

Days to germination: Number of days taken for germination of seeds was noted.

Days to first appearance of male flower: Days to first appearance of male flower of five observational vines were counted from sowing date to first appearance of male flower. The total value was average out in days.

Days to appearance of female flower: Days to first appearance of female flower of five observational vines were counted from sowing date to first appearance of female flower. The total value was average out in days.

Node number at which first male flower appears: Node number of which first male flower appeared in individual vine (selected) of a plot were recorded as node number to first male flower and average was calculated over the five vines.

Node number at which first female flower appears: Node number of which first female flower appeared in individual vine (selected) of a plot were recorded as node number to first female flower and average was calculated over the five vines.

Sex ratio: Male: female ratio was calculated by using the following formula:-
$$\frac{\text{Total no. of male flowers}}{\text{Total no. of female flowers}}$$

Vine length (m): The vine lengths of five vines were measured with the help of meter tape after 90 days of sowing in centimeter and average was calculated.

Number of branches per vine: The numbers of branches for five observational

vines were counted at the time of final harvesting and mean number of branches per vine was worked out.

Yield parameters

Number of fruits per vine: Number of fruits harvested from each observational vine at each harvesting was counted. Numbers of fruits harvested from the observational vines at different pickings were added and mean number of per vine harvested during the season was worked out.

Fruit diameter (cm): Fruit diameter of five randomly selected fruits was measured in cm and average diameter was calculated.

Fruit length (cm): A random sample of five full grown fruits was taken from each vine to record fruit length. Length was measured from peduncle end of fruit to blossom scar point with help of measuring tape. Total length of five fruits was divided by five to obtain average length of full grown fruit of the genotypes in particular replication.

Fruit weight (g): The Five edible green fruits were harvested. The weight of harvested fruits measured with the help of weighing balance in gram. After measuring average was calculated.

Days to first fruit harvest: Number of days taken from the date of sowing to the date of first harvest of the edible green fruits in a plot was recorded as days to first fruit harvest for particular genotypes.

Fruit yield (kg/vine): The total edible green fruit yield overall the picking was recorded for each plot and yield expressed as per vine by dividing number of vines.

Fruit yield tonnes per hectare: At first total fruit yield was counted per plot then it was converted in to tonnes per hectare.

Quality parameters:

Total soluble solid (⁰Brix):-Total soluble solid was determined with the help of Erma hand refract meter (0.32 ranges), averaged and analyzed.

Vitamins ‘C’ (mg/100g) of fruit juice:-The juice was filtered through muslin cloth 10ml (W) of the juice was taken with the help of pipette in 100 ml volumetric flask and the volume (V₁) was made up with 1.0% oxalic acid solution. The flask was then shaken well. The juice was then filtered known quality (V₂) of the solution was titrate against standard dye (V) solution till a faint pink color appeared and persisted for 15 seconds. The amount of ascorbic acid was calculated by the formula:-

$$\frac{1}{1} X \frac{Y \times V_1}{V_2} X \frac{100}{W} = \text{Vitamin C mg/100 ml}$$

Cucumber fresh juice

Where, Y= ml of dye indicator used in the titration. V₁= Volume to which the juice is diluted. T= Titrate volume of day with standard solution of Vitamin ‘C’ V₂= Volume of filtrate taken for titration.

Economics of Cultivation:- Cost of cultivation (Rs/ha): The cost of the inputs that was prevailing at the time of their use was considered (Appendix) to work out the cost of cultivation which is given in rupees per hectare.

Gross income (Rs): The income was calculated based on the prevailing market price for the cucumber.

Net income (Rs):The net income per hectare was calculated on the basis of gross income and coast of cultivation per hectare as follows- Net income = Gross income – Cost of cultivation

Benefit of Cost ratio: The benefit to cost ratio was worked out by using the following formula:-

$$\text{Benefit cost ratio} = \frac{\text{Gross income (Rs/ha)}}{\text{Cost of cultivation (Rs/ha)}}$$

Statistical analysis: The data on growth yield and quality components were subjected to Fisher’s method of analysis of variance (ANOVA), where the ‘F’ tests was significant for comparison of the treatment means, CD values were worked out at 5% probability level.

Analysis of Variance (ANOVA): Analysis of treatment for all treatments in Randomized Block Design was carried out. For testing the hypothesis the following ANOVA table was used.

$$\text{S.E. (d)} = \sqrt{\frac{2 \times \text{M.E.S.S.}}{r}}$$

The significance and non-significance of the treatment effect was judged with the help of ‘F’ variance ratio test. Calculated ‘F’ value was compared with the table value of ‘F’ at 5% level significant. If the calculated value exceeds the table value, the effect was considered to be significant. The significant differences between the mean were tested against the critical differences at 5% level of significance. For testing the hypothesis, the ANOVA table was used.

Results and Discussion

The present study investigation entitled “Studies on Genetic variability in ridge gourd (*Luffa acutangul* L.) in Allahabad agro-climatic condition” was carried out at experimental station, Department of

Horticulture Sam Higginbottom Institute of Agriculture Technology and Science (Deemed to be University), Allahabad Uttar Pradesh with twelve genotypes including. The data were recorded formation have been represented in this chapter along with table and illustration illustrations intended to make the theme vivid and to have clarity of contentions.

Growth Parameters:

Days to germination in different genotypes of Ridge gourd (*Luffa acutangula* L.): Days taken for germination of seed in different genotypes are presented in table and graphically depicted in Fig. 4.1. The minimum day (3.53 day) to germination was recorded in RIGVAR_6 followed by RIGVAR-1 (3.73 days) and the maximum day (5.13 days) to germination was noticed in F₁ SUMAN and Payal (4.87days). The number of days to germination is an important character. Which indicate earliness or lateness of the crop in general? The early and late germination help in the occurrence of early/late flush of corp. which is advantageous for market to fetch the higher price. The view was supported by Kumar *et al.* (2007) in bottle gourd.

Days to first appearance of female flower in different genotypes of Ridge gourd (*Luffa acutangula* L.): The number of days required to first Female flower appearance is given in table 4.3 and graphically presented in Fig. 4.3. Significantly amongst the genotypes minimum number of days were recorded for first male flower appearance in RIGVAR-6 (38.80 days) followed by RIGVAR-1 (39.93 days). The maximum number of days was found to first male flower appearance in PAYAL and SUMAN (42.87 days) respectively. The days to first Female flower appearance plays an important role in deciding the earliness or lateness or crop in

general. The variation in first Female flower appearance might have been due to intermodal length, number of intermodal and vigour of the crop. Similar finding were reported by Panwar *et al.* (1977), Arora *et al.* (1983) in sponge gourd and Sing *et al.* (2002), Karupiah *et al.* (2005) in ridge gourd. (Table and Fig. 4.3)

Node number at which first male flower appears in different genotypes of Ridge gourd (*Luffa acutangula* L.): The node at which first male flower appearance is given in Table 4.4 and graphically presented in fig. 4.4. Significantly amongst the genotypes minimum node at which first male flower appears were recorded in RIGVAR-1 (5.60 node), followed by RIGVAR-6 (5.73 node). The maximum node at which first male flower appearance in SUMAN, PAYAL and JAIPURI TORIYA (7.20 node).The node at which first male flower appears is an important role which deciding total number of male flower. The view was supported by Karupiah *et al.* (2005) in ridge gourd, Devmore *et al.* (2010) in bitter gourd and B.R. Choudhary and Suresh kumar (2011) in ridge gourd.(Table and fig. 4.4)

Node number at which first female flower appears in in different genotypes of Ridge gourd (*Luffa acutangula* L.): The node at which first Female flower appearance is given in Table 4.5 and graphically presented in fig. 4.5. Significantly amongst the genotypes minimum node at which first Female flower appears were recorded in RIGVAR-6 (11.53 node), followed by RIGVAR-1 (11.80 node). The maximum node at which first Female flower appearance in RIGVAR-5 and PAYAL (13.93 node). The node at which first Female flower appears is an important role which deciding total number of Female flower. The view was supported by Karupiah *et al.* (2005) in ridge gourd, Devmore *et al.* (2010) in bitter gourd and B.R. Choudhary and

Suresh kumar (2011) in ridge gourd.(Table and fig. 4.5).

Sex ratio in different genotypes of Ridge gourd (*Luffa acutangula* L.): Male: Female ratio in different genotypes are presented in table 4.6 and graphically depicted in fig. 4.6. The maximum ratio of male: female flower (34.00) was recorded in RIGVAR-6 and followed by NASDAR SPE. (33.67) and minimum male female ratio (26.00) was noticed in RIGVAR-2 and PAYAL. The male: female ratio is an important character which indicates earliness or lateness of the crop in general. The variation in male: female flower ratio might have been due to number of vigour of crop. Similar result for ratio of male: female flower had been reported by Shah and Kale (2002), Karuppiyah *et al.* (2005) in bottle gourd. (Table and Fig. 4.6)

Length of main Vine (m) in different genotypes of Ridge gourd (*Luffa acutangula* L.): Plant height in different genotypes are presented in table 4.7 and graphically depicted in fig. 4.7. The maximum plant height (5.30 m) was recorded in RIGAVAR-6 followed by NASDAR SPE. (5.07 m) and minimum (2.90 m) was noticed in RIGVAR-1 and RIGVAR-2. The variation in plant height might be due to the specific genetic makeup of different genotypes, inherent properties and vigour to the corp. The variations of plant height in ridge gourd have also reported by Khanikar *et al.* (1995), Karuppiyah *et al.* (2005) in ridge gourd.

Number of branches per vine in different genotypes of Ridge gourd (*Luffa acutangula* L.): Number of branches per vine in different genotypes are presented in table 4.8 and graphically depicted in fig. 4.8. The maximum branches per vine (4.93) were recorded in RIGAVAR-6 followed by NASDAR SPE. (4.87) and minimum (2.90) was noticed in RIGVAR-1(2.73) and

RIGVAR-2 (3.47). The variations of the number of branch per vine in ridge gourd have also reported by B.R. Choudhary and Suresh kumar (2011) in ridge gourd (Table and fig. 4.8)

Number of fruit per plant in different genotypes of Ridge gourd (*Luffa acutangula* L.): Investigation on number of fruit per plant indicated that all genotype differed significantly presented in table 4.9 and graphically depicted in Fig. 4.9. The maximum numbers of fruit per plant were found in genotypes RIGVAR-6 (27.27), followed by RGIVAR-4 (25.25). The lower number of fruit was recorded in F₁ SUMAN (18.67), followed by PAYAL (20.27). The fruit per plant is one of the major factors for deciding the yield of the corp. The variation in fruit per plant might have been to sex ratio and fruit set percentage. The finding was supported Panwar *et al.* (1977), Sharma and Bhutani (2001) in sponge gourd, Singh *et al.* (2002), Karuppiyah *et al.* (2005) in ridge gourd (Table and fig. 4.9).

Days to first harvest in different genotypes of Ridge gourd (*Luffa acutangula* L.): The number of days required first harvesting from the sowing is presented in Table 4.10 and graphically depicted in fig. 4.10 differed significantly the genotypes minimum no. of days to first harvesting from sowing in RIGVAR-6 (43.93days) followed by RIGVAR-1(45.13days). The maximum no. of days were found to first harvesting from sowing in RIGVAR-5(56days) followed by RAMEIYA F₁ (54days). The days to first harvesting from sowing plays an important role in deciding the earliness and lateness of fruiting the different genotypes of ridge gourd. The view was reported by Devmore *et al.* (2010) in bitter gourd, Choudhary and Suresh kumar (2011). (Table4.10, Figure 4.10)

Fruit diameter (cm) in different genotypes of Ridge gourd (*Luffa acutangula* L.): The investigation on fruit diameter differed significantly amongst the genotypes presented in table 4.11 and graphically depicted in fig. 4.11. The maximum fruit diameter was found in RIGVAR-1(4.75 cm), followed by PAYAL (4.64 cm), Minimum fruit diameter found in RIGVAR-3(3.52 cm) followed by RIGVAR-2 (3.57 cm) These variation might be due to fruit length, number of fruit per plant and number of effective node. Then the fruit setting will be higher, therefore selection should be made for higher number of effective nodes per plant. This finding was supported by Choudhary and Suresh kumar (2011), Hanumegowda *et al.*, (2011) in ridge gourd. (Table 4.11 and Figure 4.11)

Fruit length (cm) in different genotypes of Ridge gourd (*Luffa acutangula* L.): Significant differences were recorded with reference to fruit length amongst genotypes presented in table 4.12 and graphically noticed in fig. 4.12. The highest fruit length were recorded in RIGVAR-6 (24.27 cm), followed by NASDAR SPE (23.05 cm), RIGVAR-1 (22.59 cm) respectively.

Significantly Shorter fruit length was observed in the genotypes F₁ SUMAN-(18.62 cm), RIGVAR-2 (20.04 cm), RIGVAR-5(20.07 cm), respectively. Significant variation might be due to first set percentage and number of fruit per plant. The view was reported by panwar *et al.*, (1977), Arora *et al.*(1983) in sponge gourd and Singh *et al.* (2002), Karuppiyah *et al.* (2005) in ridge gourd. (Table 4.12, Figure 4.12).

Fruit weight (gm) in different genotypes of Ridge gourd (*Luffa acutangula* L.):Significant differences were recorded in weight per fruit amongst genotypes presented in table 4.13 and graphically depicted in fig. 4.13.The maximum weight per fruit was found in RIGVAR-6 (132.60 gm) followed by

RIGVAR-1 (131.32 gm). The minimum fruit weight were noted in SUMAN (99.73 gm) followed by RIGVAR-2 (101.27 gm) respectively. The significant variations in fruit weight might have been due to fruit, fruit diameter and number of fruit per plant. This results finding was supported by Sharma and Bhutani (2001) in sponge gourd, Shah *et al.* (2002) and Karuppiyah *et al.* (2005) in ridge gourd. (Table and fig. 4.13)

Fruit yield per vine (kg) in different genotypes of Ridge gourd (*Luffa acutangula* L.): The genotypes differed significantly with regard to yield per plant presented in table 4.14 and graphically depicted in fig. 4.14. The maximum yield per plant was recorded in RIGVAR-6 (3.61 kg), followed by NASDAR SPE. (3.21 kg), JAIPURI TORIYA (3.20 kg), respectively. The lower yield were recorded in SUMAN (1.86 kg), followed by RIGVAR-2 (2.05 kg) and PAYAL (2.06 kg). The significant variations in yield per plant might be due to fruit set percentage, fruit length, number fruit per plant, fruit weight and fruit diameter. These finding supported by Singh *et al.* (2002), Karuppiyah *et al.* (2005) in ridge gourd (Table and fig 4.14).

Fruit yield per hectare (t) in different genotypes of Ridge gourd (*Luffa acutangula* L.): Significant differences were recorded amongst the genotype with regard to yield tonne per hectare presented in table 4.15 and graphically depicted in Fig. 4.15. The maximum yield (t/ha) was recorded in RIGVAR-6 (60.17 t/ha), followed by and NASDAR SPE., and JAIPURI TORIYA (53.33 and 53.33t/ha) respectively. The significantly lowest yield was found in the case of SUMAN (31.00 t/ha), followed by RIGVAR-2 (34.16 t/ha). These significantly variation might have due to number of fruit per plant, yield per plant. This investigation was supported by Singh *et al.* (2008) in sponge gourd and Kanikar *et al.* (1995),

Choudhary and Sharma (2002) in ridge gourd (Table and fig. 4.15).

Total soluble solid (Brix⁰) in different genotypes of Ridge gourd (*Luffa acutangula* L.):-Analysis of data present in the table 4.16 and graphically depicted in fig. 4.16 shows that there was a significant difference among the varieties of ridge gourd. The maximum Total soluble solid (Brix⁰) value JAIPURI TORIYA (4.58), followed by RIGVAR- 1 (4.53) and NASDAR TORIYA (4.28). The lowest T.S.S (Brix⁰) value was recorded in RIGAVAR-2 (3.79), followed by RIGVAR-4 (4.02). Similar result for total soluble solid (Brix⁰) was reported by Ramchandran and Gopalakrishnan *et al.*, (1980) in bitter gourd (Table and fig. 4.16).

Vitamin ‘C’ (mg/100gm) in different genotypes of Ridge gourd (*Luffa acutangula* L.): Analysis of data present in the table 4.17 and graphically depicted in fig. 4.17 shows that the maximum Vitamin ‘C’ mg/100gm recorded in RIGVAR-6(4.59 mg),

followed by RAMEIYA F₁ (4.57 mg) and NASDAR SPE (4.57 mg). The minimum Vitamin ‘C’ mg/100gm was found case of RIGVAR-1(3.15 mg), followed by RIGVAR-2 (4.30 mg). Similar result for Vitamin ‘C’ was reported by Ramchandran and Gopalakrishnan *et al.* (1980) in bitter gourd (Table and fig. 4.17).

Economics of treatments: The economics of treatment *viz.* cost of cultivation per hectare, fruit yield, gross return, Net return and cost: benefit ratio has been worked out and presented out and presented in Table 4.18.1 and 4.18.2. RIGVAR-6 recorded maximum fruit yield (60.17 t/ha), followed by NASDAR SPE., and JAIPURI TORIYA (53.33 and 53.33t/ha) and minimum yield was recorded SUMAN (31.00 t/ha). Maximum gross return (Rs 361,020 ha⁻¹) was obtained with treatment RIGVAR-6 followed by NASDAR SPE. (Rs 321,300 ha⁻¹) and SUMAN recorded the minimum (Rs 186000 ha⁻¹).

Table.1 Meteorological data (August 2014 -November 2014)

Weeks	Temperature ⁰ C		Rainfall(mm)	Relative humidity (%)	
	Maximum	Minimum		Maximum	Minimum
August 2014					
1 st Week	34.05	26.97	17.71	87.28	61.71
2 nd week	33.85	28.05	4.97	89.71	60.71
3 rd week	35.65	28.17	0.77	84.14	56.00
4 th week	38.08	29.48	0.01	81.00	49.30
September 2014					
1 st Week	35.42	26.51	1.98	87.28	54.71
2 nd week	35.25	25.97	2.72	86.00	49.28
3 rd week	34.88	26.68	1.77	87.42	48.57
4 th week	36.62	26.44	0	85.33	46.88
October 2014					
1 st Week	35.22	25.02	15.65	87.00	47.42
2 nd week	34.65	24.51	0.14	85.58	60.85
3 rd week	32.24	20.78	0	85.71	53.14
4 th week	32.68	20.32	0	86.30	53.5
November 2014					
1 st Week	33.17	20.08	0	86.28	45.57
2 nd week	32.71	17.05	0	87.14	46.57

Source: Department of Agro forestry and agro meteorology, SHIATS Allahabad

Table.3.2 Physical and chemical properties of soil at experimental site (SHIATS)

S.No.	Particulars	Value (0-30cm depth)	Method followed
Physical properties			
1	Sand	48.15	Boyounce Hydrometer (Piper, 1966)
2	Silt	21.34	
3	Clay	30.51	
4	Textural class	Sandy loam	
Chemical properties			
1	Soil Ph	6.87	Potentiometry (Jackson, 1973)
2	EC (dsm ⁻¹ at 25 ⁰ C)	0.15	Conductivity (Bridge and Piper, 1966)
3	Organic carbon (%)	0.44	Walkely and Black's wet digestion (Jackson, 1973)
4	Available nitrogen (k ha ⁻¹)	212.56	Alkaline permanganate method (Sabbiah and Asija, 1956)
5	Available phosphorus (k ha ⁻¹)	37.32	Bray's method (Jackson, 1973)
6	Available potash (k ha ⁻¹)	210.05	Photometry (Perur et al., 1973)

Table.3.3 List of the Ridge gourd Genotypes used in the study

Treatment	Name of genotypes	Source
T ₁	RIGVAR-1	IIVR, Varanasi
T ₂	RIGVAR-2	IIVR, Varanasi
T ₃	RIGVAR-3	IIVR, Varanasi
T ₄	RIGVAR-4	IIVR, Varanasi
T ₅	RIGVAR-5	IIVR, Varanasi
T ₆	RIGVAR-6	IIVR, Varanasi
T ₇	KALYANI	ANGEL SEED COMPNY
T ₈	F ₁ SUMAN	SARAM SEED PVT LTD
T ₉	RAMEIYA F ₁	DAYAL SEED PVT LTD
T ₁₀	PAYAL	SATGORU SEED PVT LTD
T ₁₁	JAIPURI TORIYA	DAYAL SEED PVT LTD
T ₁₂	NASDAR SPE.	SATGORU SEED PVT LTD

Table.3.4 Skeleton of ANOVA

Source of variation	d.f.	S.S.	M.S.S.	F.cal.	F (table) at Result 5%
Due to replication	(r-1)	R.S.S.	$\frac{R.S.S.}{r-1}$	$\frac{R.S.S.}{M.E.S.S.}$	
Due to treatment	(t-1)	T.S.S.	$\frac{T.S.S.}{t-1}$	$\frac{M.T.S.S.}{M.E.S.S.}$	(r-1) (t-1)
Due to error	(r-1) (t-1)	E.S.S.	$\frac{E.S.S.}{(r-1)(t-1)}$	M.E.S.S.	F(t-1) (r-1)(t-1)
Total	(rt-1)	TSS	-	-	-

Where,

d.f. = Degree of freedom; r = replication
 S.S. = Sum of squares; t = treatment
 M.S.S. = Mean sum of squares; R.S.S. = Replication sum of squares
 T.S.S. = Total sum of squares; E.S.S. = Error sum of squares
 M.R.S.S. = Mean replication sum of squares
 M.T.S.S. = Mean treatment sum of squares
 M.E.S.S. = S.E. (d) x 't' error d.f. at 5% level of significance

Table.4.1 Days to germination in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Day to germination
T ₁	RIGVAR-1	3.73
T ₂	RIGVAR-2	4.60
T ₃	RIGVAR-3	4.07
T ₄	RIGVAR-4	4.33
T ₅	RIGVAR-5	4.80
T ₆	RIGVAR-6	3.53
T ₇	KALYANI	4.53
T ₈	F ₁ SUMAN	5.13
T ₉	RAMEIYA F ₁	4.67
T ₁₀	PAYAL	4.87
T ₁₁	JAIPURI TORIYA	4.00
T ₁₂	NASDAR SPE.	3.80
F-test		S
S.Ed(±)		0.17
C.D at 5%		0.35

Table.4.2 Days to first appearance of male flower in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Days to first appearance of male flower
T ₁	RIGVAR-1	34.93
T ₂	RIGVAR-2	37.73
T ₃	RIGVAR-3	36.20
T ₄	RIGVAR-4	36.67
T ₅	RIGVAR-5	36.53
T ₆	RIGVAR-6	34.07
T ₇	KALYANI	34.87
T ₈	F ₁ SUMAN	37.80
T ₉	RAMEIYA F ₁	37.20
T ₁₀	PAYAL	38.13
T ₁₁	JAIPURI TORIYA	36.13
T ₁₂	NASDAR SPE.	36.20
F-test		S
S.Ed(±)		0.41
C.D at 5%		K80.86

Table.4.3 Days to first appearance of female flower in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Days to first appearance of female flower
T ₁	RIGVAR-1	39.93
T ₂	RIGVAR-2	42.47
T ₃	RIGVAR-3	42.40
T ₄	RIGVAR-4	41.47
T ₅	RIGVAR-5	40.67
T ₆	RIGVAR-6	38.80
T ₇	KALYANI	41.40
T ₈	F ₁ SUMAN	42.87
T ₉	RAMEIYA F ₁	42.47
T ₁₀	PAYAL	42.87
T ₁₁	JAIPURI TORIYA	40.13
T ₁₂	NASDAR SPE.	40.33
F-test		S
S.Ed(±)		0.66
C.D at 5%		1.37

Table.4.4 Node at which number at which first male flower appears in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Node number at which first male flower appears
T ₁	RIGVAR-1	5.60
T ₂	RIGVAR-2	6.27
T ₃	RIGVAR-3	6.20
T ₄	RIGVAR-4	6.67
T ₅	RIGVAR-5	6.47
T ₆	RIGVAR-6	5.73
T ₇	KALYANI	6.93
T ₈	F ₁ SUMAN	7.20
T ₉	RAMEIYA F ₁	7.20
T ₁₀	PAYAL	7.60
T ₁₁	JAIPURI TORIYA	7.20
T ₁₂	NASDAR SPE.	5.87
F-test		S
S.Ed(±)		0.18
C.D at 5%		0.37

Table.4.5 Node number at which first female flower appears in in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Node number at which first female flower appears
T ₁	RIGVAR-1	11.80
T ₂	RIGVAR-2	13.40
T ₃	RIGVAR-3	13.13
T ₄	RIGVAR-4	13.67
T ₅	RIGVAR-5	13.93
T ₆	RIGVAR-6	11.53
T ₇	KALYANI	13.20
T ₈	F ₁ SUMAN	13.73
T ₉	RAMEIYA F ₁	13.87
T ₁₀	PAYAL	13.93
T ₁₁	JAIPURI TORIYA	13.87
T ₁₂	NASDAR SPE.	12.47
F-test		S
S.Ed(±)		0.30
C.D at 5%		0.61

Table.4.6 Sex ratio in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Sex ratio
T ₁	RIGVAR-1	33.07
T ₂	RIGVAR-2	26.00
T ₃	RIGVAR-3	28.33
T ₄	RIGVAR-4	31.87
T ₅	RIGVAR-5	32.73
T ₆	RIGVAR-6	34.00
T ₇	KALYANI	27.20
T ₈	F ₁ SUMAN	29.60
T ₉	RAMEIYA F ₁	27.93
T ₁₀	PAYAL	26.00
T ₁₁	JAIPURI TORIYA	29.27
T ₁₂	NASDAR SPE.	33.67
F-test		S
S.Ed(±)		0.56
C.D at 5%		1.17

Table.4.7 Length of main Vine (m) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Length of main vine (m)
T ₁	RIGVAR-1	2.90
T ₂	RIGVAR-2	2.90
T ₃	RIGVAR-3	2.97
T ₄	RIGVAR-4	3.47
T ₅	RIGVAR-5	3.77
T ₆	RIGVAR-6	5.30
T ₇	KALYANI	2.97
T ₈	F ₁ SUMAN	4.40
T ₉	RAMEIYA F ₁	4.00
T ₁₀	PAYAL	4.90
T ₁₁	JAIPURI TORIYA	4.43
T ₁₂	NASDAR SPE.	5.07
F-test		S
S.Ed(±)		0.27
C.D at 5%		0.57

Table.4.8 Number of branches per vine in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Number of branch per vine
T ₁	RIGVAR-1	2.73
T ₂	RIGVAR-2	3.47
T ₃	RIGVAR-3	3.80
T ₄	RIGVAR-4	4.07
T ₅	RIGVAR-5	3.93
T ₆	RIGVAR-6	4.93
T ₇	KALYANI	4.53
T ₈	F ₁ SUMAN	3.60
T ₉	RAMEIYA F ₁	4.47
T ₁₀	PAYAL	4.33
T ₁₁	JAIPURI TORIYA	4.67
T ₁₂	NASDAR SPE.	4.87
F-test		S
S.Ed(±)		0.21
C.D at 5%		0.44

Table.4.9 Number of fruit per plant in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Number of fruit per plant
T ₁	RIGVAR-1	22.33
T ₂	RIGVAR-2	20.33
T ₃	RIGVAR-3	21.20
T ₄	RIGVAR-4	25.00
T ₅	RIGVAR-5	23.40
T ₆	RIGVAR-6	27.27
T ₇	KALYANI	23.13
T ₈	F ₁ SUMAN	18.67
T ₉	RAMEIYA F ₁	21.40
T ₁₀	PAYAL	20.27
T ₁₁	JAIPURI TORIYA	24.80
T ₁₂	NASDAR SPE.	24.73
F-test		S
S.Ed(±)		0.32
C.D at 5%		0.67

Table.4.10 Days to first harvest in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Day to first harvest
T ₁	RIGVAR-1	45.13
T ₂	RIGVAR-2	51.80
T ₃	RIGVAR-3	52.93
T ₄	RIGVAR-4	45.67
T ₅	RIGVAR-5	56.00
T ₆	RIGVAR-6	43.93
T ₇	KALYANI	45.60
T ₈	F ₁ SUMAN	53.67
T ₉	RAMEIYA F ₁	54.00
T ₁₀	PAYAL	50.33
T ₁₁	JAIPURI TORIYA	45.60
T ₁₂	NASDAR SPE.	45.93
F-test		S
S.Ed(±)		1.05
C.D at 5%		2.19

Table.4.11 Fruit diameter (cm) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Fruit diameter (cm)
T ₁	RIGVAR-1	4.75
T ₂	RIGVAR-2	3.57
T ₃	RIGVAR-3	3.52
T ₄	RIGVAR-4	4.32
T ₅	RIGVAR-5	4.35
T ₆	RIGVAR-6	4.25
T ₇	KALYANI	3.87
T ₈	F ₁ SUMAN	4.43
T ₉	RAMEIYA F ₁	4.09
T ₁₀	PAYAL	4.64
T ₁₁	JAIPURI TORIYA	4.59
T ₁₂	NASDAR SPE.	4.16
F-test		S
S.Ed(±)		0.13
C.D at 5%		0.28

Table.4.12 Fruit length (cm) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Fruit length (cm)
T ₁	RIGVAR-1	22.59
T ₂	RIGVAR-2	20.04
T ₃	RIGVAR-3	21.61
T ₄	RIGVAR-4	21.77
T ₅	RIGVAR-5	20.07
T ₆	RIGVAR-6	24.27
T ₇	KALYANI	21.18
T ₈	F ₁ SUMAN	18.62
T ₉	RAMEIYA F ₁	20.32
T ₁₀	PAYAL	21.05
T ₁₁	JAIPURI TORIYA	21.86
T ₁₂	NASDAR SPE.	23.05
F-test		S
S.Ed(±)		0.41
C.D at 5%		0.85

Table.4.13 Fruit weight (gm) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Fruit weight (g)
T ₁	RIGVAR-1	131.33
T ₂	RIGVAR-2	101.27
T ₃	RIGVAR-3	109.60
T ₄	RIGVAR-4	110.33
T ₅	RIGVAR-5	102.93
T ₆	RIGVAR-6	132.60
T ₇	KALYANI	125.60
T ₈	F ₁ SUMAN	99.73
T ₉	RAMEIYA F ₁	112.33
T ₁₀	PAYAL	102.07
T ₁₁	JAIPURI TORIYA	129.07
T ₁₂	NASDAR SPE.	130.13
F-test		S
S.Ed(±)		1.13
C.D at 5%		2.35

Table.4.14 Fruit yield per vine (kg) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Fruit yield per vine (kg)
T ₁	RIGVAR-1	2.76
T ₂	RIGVAR-2	2.05
T ₃	RIGVAR-3	2.32
T ₄	RIGVAR-4	2.75
T ₅	RIGVAR-5	2.40
T ₆	RIGVAR-6	3.61
T ₇	KALYANI	2.80
T ₈	F ₁ SUMAN	1.86
T ₉	RAMEIYA F ₁	2.40
T ₁₀	PAYAL	2.06
T ₁₁	JAIPURI TORIYA	3.20
T ₁₂	NASDAR SPE.	3.21
F-test		S
S.Ed(±)		0.09
C.D at 5%		0.19

Table.4.15 Fruit yield per hectare (t) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Yield ha ⁻¹ (t)
T ₁	RIGVAR-1	48.33
T ₂	RIGVAR-2	34.16
T ₃	RIGVAR-3	38.66
T ₄	RIGVAR-4	45.83
T ₅	RIGVAR-5	40.00
T ₆	RIGVAR-6	60.17
T ₇	KALYANI	49.50
T ₈	F ₁ SUMAN	31.00
T ₉	RAMEIYA F ₁	40.00
T ₁₀	PAYAL	34.33
T ₁₁	JAIPURI TORIYA	53.33
T ₁₂	NASDAR SPE.	53.55
F-test		S
S.Ed(±)		0.31
C.D at 5%		0.64

Table.4.16 Total soluble solid (0Brix) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	TSS(Brix ⁰)
T ₁	RIGVAR-1	4.53
T ₂	RIGVAR-2	3.79
T ₃	RIGVAR-3	4.10
T ₄	RIGVAR-4	4.02
T ₅	RIGVAR-5	4.24
T ₆	RIGVAR-6	4.25
T ₇	KALYANI	3.83
T ₈	F ₁ SUMAN	3.81
T ₉	RAMEIYA F ₁	4.20
T ₁₀	PAYAL	4.31
T ₁₁	JAIPURI TORIYA	4.58
T ₁₂	NASDAR SPE.	4.28
F-test		S
S.Ed(±)		0.09
C.D at 5%		0.18

Table.4.17 Vitamin 'C' (mg/100gm) in different genotypes of Ridge gourd (*Luffa acutangula* L.)

Treatment	Name of genotypes	Vitamin 'C' mg/100gm
T ₁	RIGVAR-1	3.15
T ₂	RIGVAR-2	4.30
T ₃	RIGVAR-3	4.39
T ₄	RIGVAR-4	4.56
T ₅	RIGVAR-5	4.45
T ₆	RIGVAR-6	4.59
T ₇	KALYANI	4.41
T ₈	F ₁ SUMAN	4.55
T ₉	RAMEIYA F ₁	4.57
T ₁₀	PAYAL	4.53
T ₁₁	JAIPURI TORIYA	4.54
T ₁₂	NASDAR SPE.	4.57
F-test		NS
S.Ed(±)		0.64
C.D at 5%		1.33

Table.4.18.1 Cost of Agronomical practices of cultivation

S. No.	Particulars	Unit	Qty	Rate / unit Rs.	Total cost (Rs.)
A. Land Preparation					
1	Ploughing	Hours	3	500	1,500
2	Disc Harrowing	Hours	3	500	1,500
3	Leveling with cultivars	Hours	2	400	800
4	Layout of the field	Labour	20	200	4,000
B. Fertilizers, manures and seed					
1	Farmyard Manure	Tonnes	25	800	20,000
2	Urea (150 N ha ⁻¹)	Kg	326	8	2,608
3	S.S.P. (50 kg P ₂ O ₅ ha ⁻¹)	Kg	313	10	3,130
4	Seed materials	Kg	3.5	500	1,750
5.	Mandays for application	Mandays	15	200	3,000
C. Intercultural operations					
1.	Weeding and hoeing (2Nos.)	Mandays	15	200	3,000
2.	Insecticides and pesticides	Liter	8	300	2,400
3.	Spraying of chemicals	Mandays	5	200	1,000
D. Irrigation					
1	Tubewell Charges	Irrigation	8	500	4,000
2	Irrigation	Labour	16	200	3,200
E. Other materials					
1.	Wire	Kg	60	75	4,500
2.	Bamboo Sticks	Nos.	1200	10	12,000
F. Harvesting					
1.	10 Mandays per day for 4 days	Mandays	40	200	8,000
2.	Transportation charges				2,500
G. Rental charges of land		Months	3	1500	4,500
H. Total Expenditure					83,388
I. Interest working at 12 %					10,006
Total cost of Cultivation					93,394

Table.4.18.2 Economics of different treatment and benefit cost ratio.

T. No.	Genotypes	Fruit yield t ha ⁻¹	Gross Return Rs. ha ⁻¹	Cost of Cultivation Rs. ha ⁻¹	Net Return Rs. ha ⁻¹	Benefit Cost ratio
T ₁	RIGVAR-1	48.33	289,980	93,394	196,586	3.10
T ₂	RIGVAR-2	34.16	204,960	93,394	111,566	2.19
T ₃	RIGVAR-3	38.66	231,960	93,394	138,566	2.48
T ₄	RIGVAR-4	45.83	274,980	93,394	181,586	2.94
T ₅	RIGVAR-5	40.00	240,000	93,394	146,606	2.56
T ₆	RIGVAR-6	60.17	361,020	93,394	267,626	3.86
T ₇	KALYANI	49.50	297,000	93,394	203,606	3.18
T ₈	F ₁ SUMAN	31.00	186,000	93,394	92,606	1.99
T ₉	RAMEIYA F ₁	40.00	240,000	93,394	146,606	2.56
T ₁₀	PAYAL	34.33	205,980	93,394	112,586	2.20
T ₁₁	AIIPURI TORIYA	53.33	319,980	93,394	226,586	3.42
T ₁₂	NASDAR SPE.	53.55	321,300	93,394	227,906	3.44

Selling rate = Rs. 6000 Rs/t

Maximum net return (Rs 267,626 ha⁻¹) was obtained with treatment RIGVAR-6 followed by NASDAR SPE. (Rs 227, 906 ha⁻¹) and SUMAN recorded the minimum (Rs 92,606 ha⁻¹). Benefit cost ratio was recorded maximum RIGVAR-6 (3.86)

followed by NASDAR SPE. (3.44) and SUMAN (1.99) recorded the minimum. In conclusion, the present investigation entitled “Studies on Genetic variability in ridge gourd (*Luffa acutangula* L.(Roxb.) in Allahabad agro-climate conditions.” Was

conducted at vegetable research from, Department of horticulture, Sam Higginbottom Institute of agriculture Technology and science (Deemed to be University Allahabad) Uttar Pradesh. The experiment was conducted in Randomized Block Design with three replication. The observations were recorded on 17 quantitative characters. Viz. Days to germination, Days to Days to first appearance of male flower, Days to first appearance of female flower, Node number at which first male flower appear, Node number at which first female flower appear, Sex ratio, Length of main vine (m), Number of branches per vine, Days to first fruit harvest, Number of fruits per vine, Fruit diameter (cm), Fruit length (cm), Fruit weight (g), Fruit yield (kg/vine), Fruit yield (tonnes /hectare), Total soluble solid (⁰Brix), Vitamin 'C' mg/100g, The data were analyzed to estimate the variability.

From the present investigation it was concluded that treatment (T6) RIGVAR-6 was found to be the best out of 12 genotype in terms growth, yield, quality and economic returns. The highest B: C ratio (3.86) was found for ridge gourd, in genotype RIGVAR-6 under the agro-climatic condition of Allahabad, However since this is based on one season experiment therefore further trials may be substantiated the results.

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