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Genotype screening and character assosiation studies in indeginous genotypes of ridge gourd [*Luffa acutangula* (Roxb.) L.]

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Abstract
Forty two genotypes of ridge gourd were screened and studied for character association during summer season, 2013. Out of forty two, monoecious genotypes PCPGR-7446, PCPGR-3112, PCPGR-5563 were found earlier in first fruit harvesting i.e. 54.20, 53.58 and 53.50, respectively than the best check (Pant-Torai-1). However, Genotypes (hermaphrodite ridge gourd) PCPGR-3239, PCPGR-3715, PCPGR-5991 were found earlier in first fruit harvesting i.e. 48.41, 48.15, 47.71, respectively than the best check (Satputia). Highest fruit yield (q/ha) was recorded in monoecious genotypes PCPGR-3711 followed by PCPGR-3233, PCPGR-3704, PCPGR-7267, PCPGR-7447 which were 119.33, 115.44, 113.31, 106.47, 99.91, respectively. While in genotypes of hermaphrodite ridge gourd, genotypes Satputia, PCPGR-3716, PCPGR-7275 and PCPGR-3702 were recorded significantly higher fruit yield (q/ha). In present investigation, Fruit yield perceived positive correlation with fruit length, number of fruits per plant and average fruit weight. This indicates that selection for these traits would be effective to improve fruit yield in ridge gourd.

Keywords: Genotype screening, character association, *Luffa acutangula* (Roxb.) L

Introduction
Ridge gourd [*Luffa acutangula* (Roxb.) L.] having 2n=2x=26, is one of the important cucurbitaceous vegetable crop with old world, origin in subtropical Asian, region including particularly India. The name 'Luffa' or 'Loofah' is of Arabic origin. Sanskrit name 'Koshataki' of ridge gound indicates its early cultivation in India Kalloo 1993 [12]. It is generally monoecious in nature but hermaphrodite, andromonoecious, trimonoecious, gynoecious lowering form has also been, reported Swarup 2006 [22]. Ridge gourd, is grown throughout India in tropical and subtropical climate, both as spring-summer and rainy season crop known as ribbed gourd or angled gourd or silky gourd or angled loofah or vegetable gourd. Fruits of Luffa spp. are very nutritious and good source of vitamin A, calcium, phosphorus, ascorbic acid iron Aykroyd 1963 [2]. Genetic diversity is a prerequisite for an effective plant breeding programme. It is a useful and essential tool for parent's choice in hybridization to develop high yield potential cultivars and to meet the diversified goals of plant breeding [Gaur *et al* 1978 [8]; Haydar *et al.* 2007 [10]; and Shekhawat *et al.* 2001 [19]. Hornokova *et al.* 2003 [11] stated that the knowledge of genetic diversity helps in the identification, differentiation and characterization of genotypes or populations. Study of the genetic association of the major characters contributing to the final expression of yield would be helpful in two ways from breeder's point of view. Firstly in selection of the important marker characters highly associated with the higher expression of yield and secondly, to improve one character without losing much in the other. Thus the present study was carried out to select superior genotypes based on existence of genotypic variation and to know the association of different yield contributing traits in ridge gourd.

Materials and Methods
The present study entitled "Genotype screening and character assosiation studies in indigenous genotypes of ridge gourd [*Luffa acutangula* (Roxb.) L.]" was carried out at Pantnagar Center for Plant Genetic Resources (PCPGR) during summer season, 2013 of G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India. Forty two genotypes (28 monoecious and 14 hermaphrodite) of ridge gourd were grown in Augmented Block Design II including two checks (Pant Torai-1 and Satputia) which were arranged in five blocks, each block possess eight genotypes with two checks. Observation were recorded on fifteen yield and yield contributing characters i.e. node number to first female flower,

days to first female flower anthesis, days to first fruit harvesting, fruit length (cm), fruit diameter (cm), fruit flesh thickness (cm), average fruit weight (g), main vine length (m), number of primary branches, number of fruits/plant, fruit yield (q/ha), seed length (cm), seed width (cm), number of seeds/fruit and 100 seed weight (g). The major objectives of study were to screen superior genotypes based on the genetic variability and association of different characters of ridge gourd genotypes. The analysis of variance for augmented design was done by using the method given by Federer (1956) [6]; and Federer and Raghavarao (1975) [7].

Results and Disscuson

Analysis of variance (ANOVA)

Analysis of variance (table 2) for 15 characters *viz.*, number of primary branches, main vine length (m), days to first female flower anthesis, node number to first female flower, days to first fruit harvesting, fruit length (cm), fruit diameter (cm), fruit flesh thickness (cm), number of fruits per plant, average fruit weight (g), fruit yield (q/ha), seed length (cm), seed width(cm), 100 seed weight (g), number of seeds/fruit in augmented block design II are presented in Table 1. All the characters studied showed highly significant difference among check varieties. The significant difference indicates the existence of variability for various traits. Sahni *et al.* (1987) [17]; and Singh *et al.* (2012) [20] also reported difference for various characters in ridge gourd genotypes. The description of all genotypes included in study was given in table 1 with respect to flowering behaviour and place of collection.

Estimation of variability

Genetic resource is a basic tool for plant/crop improvement. Variability is the basis of crop improvement which in turn is provided by germplasm. The sum total of all the hereditary materials in a species has been termed as germplasm (Allard, 1960) [1].

The general mean, range of variation and per cent range of variation for different characters are given in Table 3, while check means and least significant differences are presented in Tables 4. The numbers of promising genotypes during summer season, 2013 are depicted in Tables 5 and 6. Data in the table 3 indicates that the range of variability was maximum for number of seeds/fruit (100 to 874.60) followed by fruit yield q/ha (100 to 709.45), node number to first female flower (100 to 432.70), number of fruits per plant (100 to 431.95) while days to first fruit harvesting shows minimum variability i.e. 100-145.68.

The possibility of improvement in crop is measured by variability. Wider the genetic variability greater is the chances of improvement through selections. The genotypic variability in population is due to genotypic differences among individuals for particular characters. On the other hand phenotypic variations are observable as differences present in individuals and include both genetic and environmental components (Dudley and Moll, 1968) [5]. Several workers viz., Solanki *et al.* (1980) [21] in cucumber; Sahni *et al.* (1987) [17]; Varalaxshami *et al.* (1995) [23]; Singh *et al.* (2012) [20]; Ram *et al.* (2006) [15], Choudhary *et al.* (2007) [3] and Prakash *et al.* (2013) [13] in ridge gourd, has worked on the variability studies.

With respect to different parameters which contributes to yield, significantly higher or lower mean values has been recorded to identify the superior genotypes based on their performance under field conditions. This will also helps breeders in selecting genotypes with respect to their economic traits which will be desirable for inclusion in any future breeding programme for developing the high yielding varieties.

1. Node number to first female flower

None genotypes recorded significantly lower value in node number to first female flower than best check variety (Satputia *i.e.* 5.11). However, seven genotypes recorded significantly higher value in node number to first female flower than the lowest check variety (Pant-Torai-1 *i.e.* 7.83).

2. Days to first female flower anthesis

Eleven genotypes recorded significantly earlier in days to first female flower anthesis than best check variety (Satputia *i.e.* 39.60). However, three genotypes recorded significantly late in days to first female flower anthesis than the lowest check variety (Pant-Torai-1 *i.e.* 49.16).

3. Days to first fruit harvesting

Among all the forty genotypes twenty genotypes recorded significantly earlier in days to first fruit harvesting than the best check variety (Satputia *i.e.* 49.08) while two genotypes was recorded significantly late in days to first fruit harvesting than the lowest check variety (Pant-Torai-1 *i.e.* 56.58).

In ridge gourd breeding programme, lower values for these traits above numbered as 1,2 and 3 is desirable to develop early cultivars. However, it is known fact that earliness has negative relationship with yield but this loss can be overcome by fetching higher prices of produce reaches early in the market.

4. Fruit length (cm)

Four genotype recorded significantly longer fruit length than best check variety (Pant-Torai-1 *i.e.* 16.96cm) and twenty seven genotypes recorded significantly shorter fruit length than lowest check variety(Satputia *i.e.* 10.70 cm).

5. Fruit diameter (cm)

None genotype recorded significantly higher fruit diameter than best check variety (Pant-Torai-1 *i.e.* 4.67 cm).However, one genotype shows higher fruit diameter than the best check variety.

None genotype recorded significantly less fruit diameter than lowest check variety (Satputia *i.e.*2.13 cm)

6. Fruit flesh thickness (cm)

As the data revealed in the Table 4.6 shows that none genotype recorded significantly more in fruit flesh thickness than best check variety (Pant-Torai-1 *i.e.* 0.312 cm).However, two genotypes recorded more in fruit flesh thickness than the best check variety.

Thirty nine genotypes recorded significantly less in fruit flesh thickness than the lowest check variety (Satputia *i.e.* 0.216 cm).

7. Average fruit weight (g)

Among all the forty genotypes only five genotypes recorded significantly higher in average fruit weight than the best check variety(Pant-Torai-1 *i.e.* 124.96 g) while nineteen genotypes was recorded significantly lower in average fruit weight than the lowest check variety(Satputia *i.e.* 91.64 g).

8. Main vine length (m)

None genotype recorded significantly longer in vine length

than best check variety (Satputia *i.e.* 5.04 m). However, five genotypes show longer vine length than the best check variety. Thirty nine genotypes recorded significantly shorter main vine length than lowest check (Pant-Torai-1 *i.e.* 4.72).

9. Number of primary branches

The perusal data presented in Table 4.6 revealed that one genotype (PCPGR-3111 *i.e.* 9.22) recorded significantly more number of primary branches than best check variety (Satputia *i.e.* 7.98) and seventeen genotypes recorded significantly less number of primary branches than lowest check(Pant-Torai-1 *i.e.* 4.82).

10. Number of fruits per plant

Among all the forty genotypes only two genotypes recorded significantly higher in number of fruits per plant than the best check variety(Satputia *i.e.* 15.97) while thirty three genotypes was recorded significantly lower in number of fruits per plant than the lowest check variety(Pant-Torai-1 *i.e.* 14.01)

11. Fruit yield (q/ha)

Only five genotypes recorded significantly higher in fruit yield than the best check variety (Pant-Torai-1 *i.e.* 96.69 q/ha) while thirty four genotypes was recorded significantly lower in fruit yield than the lowest check variety (Satputia *i.e.* 74.04 q/ha)

12. Seed length (cm)

None genotype recorded significantly higher in seed length than best check variety (Pant-Torai-1 *i.e.* 1.18 cm). However, twelve genotypes shows higher seed length than the best check variety.

Thirty nine genotypes recorded significantly less in seed length than the lowest check variety (Satputia *i.e.* 1.08 cm).

13. Seed width (cm)

None genotype recorded significantly higher in seed width than the best check variety (Pant-Torai-1 *i.e.* 0.812cm). However, two genotypes shows higher seed width than the best check variety and thirty nine genotype recorded significantly less in seed width than the lowest check variety (Satputia *i.e.* 0.686 cm).

14. Number of seeds/fruit

Four genotype recorded significantly higher in number of seed per fruit than best check variety (Pant-Torai-1 *i.e.* 102.77) and thirty six genotypes was recorded significantly less in number of seed per fruit than the lowest check variety(Satputia *i.e.* 97.55).

15. 100 seed weight (g)

As per the data in table 4.6, nine genotype recorded significantly higher in 100 seed weight than best check variety (Pant-Torai-1 *i.e.* 10.80 g) and twenty eight genotypes was recorded significantly less in 100 seed weight than the lowest check variety (Satputia *i.e.* 10.40 g).

Here parameter from numbered from 4 to 15, all contributes to yield in direct or indirect way. Just by observing or selecting any genotype on the basis on single trait value yield cannot be improved because yield is a complex and highly variable character, and is a result of cumulative effect of its component characters. As a result, direct selection for yield may not be very effective. The yield components may not always be independent in their action but may be interlinked. So selection applied for a particular character may bring simultaneous change in other which may or may not be desirable. Therefore, it is advisable to back up certain close associations which are understood to have been found between yield and its contributing characters. Consequently, a considerable improvement can be brought about in a desired direction. It is therefore, necessary to study the nature of the association between yield and its components which we discussed further.

- Highest number of primary branches was recorded in monoecious genotypes PCPGR-3111 followed by PCPGR-5562, GP 2014-1, PCPGR-7253, PCPGR-7333 which were 9.22, 8.81, 8.26, 8.17, 7.54, respectively. While in genotypes of hermaphrodite ridge gourd, highest number of primary branches was recorded in Satputia, followed by PCPGR-3239, PCPGR-3702, PCPGR-3715, PCPGR-7261 which were 7.98, 6.93, 6.46, 6.13, and 6.11, respectively.
- Monoecious genotypes PCPGR-5562 (5.45 m), GP 2014-1 (5.29 m) were registered as best performer for main vine length (m). However, Genotypes PCPGR-7261(5.54 m), PCPGR-3239(5.40 m) was registered as best performer for main vine length (m) in genotypes of hermaphrodite ridge gourd.
- Monoecious genotypes PCPGR-5562, PCPGR-7446 and PCPGR-3112 were earlier in producing first female flower i.e. 48.54, 47.79, 47.23, respectively than the best check (Pant Torai-1). However, in genotypes of hermaphrodite ridge gourd, genotypes PCPGR-3715, PCPGR-7261 and PCPGR-7247 were earlier in producing first female flower i.e. 39.56, 38.19, 37.92, respectively than the best check (Satputia).
- Monoecious genotypes PCPGR-7447, PCPGR-7333, PCPGR-5563 produced first female flower on node no 16.14, 14.02, 11.21, respectively. However, genotypes of hermaphrodite ridge gourd, PCPGR-3234, PCPGR-7261, PCPGR-3716, produced first female flower on node no 8.40, 7.85, and 7.04, respectively.
- Monoecious genotypes PCPGR-7446, PCPGR-3112, PCPGR-5563 were found earlier in first fruit harvesting i.e. 54.20, 53.58 and 53.50, respectively than the best check (Pant-Torai-1). However, Genotypes (hermaphrodite ridge gourd) PCPGR-3239, PCPGR-3715, PCPGR-5991 was found earlier in first fruit harvesting i.e. 48.41, 48.15, 47.71, respectively than the best check (Satputia).
- Monoecious genotypes PCPGR-7267, PCPGR-7448, PCPGR-3055, GP 2014-1 and PCPGR-7447 had significantly higher fruit length (cm) as compared to best check variety (Pant Torai-1. However, hermaphrodite ridge gourd genotypes PCPGR-3716, PCPGR-3700, PCPGR-3234 had significantly higher fruit length (cm) than best check (Satputia).
- Highest fruit diameter (cm) was recorded in monoecious genotypes PCPGR-5991 followed by PCPGR-3700, PCPGR-3234, PCPGR-2264, and PCPGR-3716 which were 3.70, 3.52, 3.42, 3.15, and 3.02, respectively. While in genotypes of Satputia, genotypes PCPGR-3716, PCPGR-3700, PCPGR-3234 had significantly higher fruit diameter as compared to best check (Satputia).
- Fruit flesh thickness was maximum in PCPGR-7255 (0.414cm) followed by PCPGR-7448 (0.354), Pant-Torai-1(0.312), PCPGR-7245 (0.304), PCPGR-3705 (0.284) while in genotypes of hermaphrodite ridge gourd, genotype PCPGR-3716(0.244 cm) was recorded maximum fruit flesh thickness followed by PCPGR-3700

(0.240), PCPGR-5991 (0.229) and PCPGR-3234 0.223.

- Number of fruits per plant was maximum in monoecious genotypes PCPGR-3711(18.52), PCPGR-3704 (17.73), PCPGR-3233 (17.31) and PCPGR-7447 (15.60) while in genotypes of hermaphrodite ridge gourd, it was found maximum in PCPGR-3716 (19.87), PCPGR-3702 (17.86), PCPGR-3700 (17.66) and PCPGR-7275 (16.74).
- Monoecious genotypes PCPGR-7267, PCPGR-7448, PCPGR-7369, GP 2014-1 and PCPGR-7333 had significantly higher average fruit weight (g) as compared to best check variety (Pant Torai-1).However, in hermaphrodite ridge gourd genotypes Satputia, PCPGR-7261, PCPGR-3715 and PCPGR-3239 had significantly higher average fruit weight(g) than best check.
- Highest fruit yield (q/ha) was recorded in monoecious genotypes PCPGR-3711 followed by PCPGR-3233, PCPGR-3704, PCPGR-7267, PCPGR-7447 which were 119.33, 115.44, 113.31, 106.47, 99.91, respectively. While in genotypes of hermaphrodite ridge gourd, genotypes Satputia, PCPGR-3716, PCPGR-7275 and PCPGR-3702 were recorded significantly higher fruit yield (q/ha)
- Seed length (cm) was maximum in GP 2014-1 (1.38cm) followed by PCPGR-7253 (1.35cm), PCPGR-7447 (1.29cm), PCPGR-7245 (1.26cm), PCPGR-7267 (1.24cm) while in genotypes of hermaphrodite ridge gourd, genotypes PCPGR-7275 (1.094cm) was recorded maximum seed length(cm) followed by PCPGR-3234 (1.092cm), PCPGR-3715 (1.090cm) and PCPGR-7261 (1.088cm).
- Maximum seed width (cm) was found in genotype PCPGR-7253 (0.818cm) followed by PCPGR-7252 (0.814cm), and PCPGR-5563 (0.809cm) while in hermaphrodite ridge gourd genotypes, it was found maximum in PCPGR-3716 (0.778cm) followed by PCPGR-3239 (0.729cm), PCPGR-3234 (0.725cm) and PCPGR-7261 (0.719).
- 100 seed weight (g) was recorded maximum in GP 2014-1 (15.04g) followed by PCPGR-3708 (14.77g), PCPGR-7447 (14.28g) while in genotypes of hermaphrodite ridge gourd, it was recorded maximum in PCPGR-7247 (12.37g) followed by PCPGR-3700 (11.03g), PCPGR-3234 (10.67g).
- Highest number of seed per fruit was recorded in genotypes PCPGR-7447 followed by PCPGR-7369, PCPGR-7446, and PCPGR-7448 which were 132.58, 120.59, 117.59, and 110.74, respectively. While in genotypes of hermaphrodite ridge gourd, genotypes Satputia, PCPGR-3753, PCPGR-3715 and PCPGR-7261 were recorded significantly higher number of seed per fruit.

Character association

Availability of sufficient variability and association among different characters are the pre-requisite for executing an effective selection programme for crop improvement. Yield, being a complex quantitative trait, is dependent on a number of component characters. Therefore, knowledge of association of different components together with their relative contributions has immense value in selection. The estimation of correlation coefficients among different economic traits has been presented in Table 7.

The perusal of data presented in Table 7 revealed that fruit yield had positive and highly significant correlation with fruit length (0.565), number of fruits per plant (0.639) and average fruit weight (0.481).Average fruit weight was found positive and significantly associated with node number to first female flower (0.346), fruit length (0.765), and fruit diameter (0.619) and fruit flesh thickness (0.481). However, it was negatively and significantly correlated with number of fruits per plant (-0.312). Fruit flesh thickness was directly and positively correlated with fruit length (0.560), fruit diameter (0.718). However, fruit diameter had direct and positive association with fruit length (0.521).

Days to first fruit harvesting was positively and significantly correlated with days to first female flower anthesis (0.972) and node number to first female flower (0.657). Number of primary branches showed positive and significant correlation with main vine length (0.682).

Seed length (cm) was directly and significantly positively correlated with fruit length (0.604), fruit diameter (0.320), fruit flesh thickness (0.353), average fruit weight (590) and fruit yield (0.590). Seed width (cm) was found positively correlated with fruit length (0.330), fruit diameter (0.383), fruit flesh thickness (0.319), average fruit weight (0.494) and seed length (0.662). Number of seeds/fruit was highly significant and positively correlated with days to first female flower anthesis (0.514), node number to first female flower (0.384) days to first fruit harvesting (0.503), fruit length (0.357) and average fruit weight (0.365). 100 seed weight (g) show positive significant correlation with node number to first female flower (0.340), fruit length (0.384), fruit diameter (0.418), fruit flesh thickness (0.374), average fruit weight (0.508), seed length (0.641) and seed width (0.499).

Study of the genetic association of the major character contributing to the final expression of yield would be helpful in two ways from breeder's point of view. Firstly in selection of the important marker characters highly associated with the higher expression of yield and secondly, to improve one character without losing much in the other. The association between any two variables is termed as simple correlation or total correlation or zero order correlation coefficient. A positive value of correlation coefficient between two characters shows that the changes of two variables are in the same direction, *i.e*., high values of one variable are associated with high values of other and vice-versa. When correlation is negative, the movements are in opposite directions, *i.e*., high values of one variable are associated with low values of other.

In present investigation, Fruit yield perceived positive correlation with fruit length, number of fruits per plant and average fruit weight. This indicates that selection for these traits would be effective to improve fruit yield in ridge gourd. Positive correlation of fruit yield has been reported with fruit length, number of fruits per plant and fruit weight which is in line with the findings of several workers viz., Rao *et al*. 2000 [16]; Ram *et al.* 2006 [15]; Samadia, 2011 [18]; Rabbani, 2012 [14]; and Dubey *et al.* 2013 [4]. Hanumegowda *et al.* (2012) [9] reported that fruit length had highly significant and positive association with number of seeds per fruit.

Table 1: Genotypes and their place of origin

SI. No.	Genotypes	Place of collection	Monoecious/Hermaphrodite
1	GP 2014-1	Chamoli, Uttarakhand	Monoecious
2	PCPGR-2264	Girdharpur, Raibareilly, U.P.	Hermaphrodite
3	PCPGR-3055	Joshimath, Tehri, Uttarakhand	Monoecious
4	PCPGR-3111	Bahraich, U.P.	Monoecious
5	PCPGR-3112	Shivpur, Varanasi, U.P.	Monoecious
6	PCPGR-3233	Shahgar, Azamgarh, U.P.	Monoecious
7	PCPGR-3234	Shivpur, Varanasi, U.P.	Hermaphrodite
8	PCPGR-3235	Mau, U.P.	Hermaphrodite
9	PCPGR-3239	Shahgar, Azamgar, U.P.	Hermaphrodite
10	PCPGR-3700	Shazadpur, Ambedkarnagar, U.P.	Hermaphrodite
11	PCPGR-3702	Akbarpur, Ambedkarnagar, U.P.	Hermaphrodite
12	PCPGR-3704	Ashapur, Varanasi, U.P.	Monoecious
13	PCPGR-3705	Akbarpur, Ambedkarnagar, U.P.	Monoecious
14	PCPGR-3708	Akbarpur, Ambedkarnagar, U.P.	Monoecious
15	PCPGR-3709	Budhanpur, Gazipur, U.P	Monoecious
16	PCPGR-3710	Mukaddumpur, Gazipur, U.P.	Monoecious
17	PCPGR-3711	Budhanpur, Gazipur, U.P.	Monoecious
18	PCPGR-3713	Shazadpur, Ambedkarnagar, U.P.	Monoecious
19	PCPGR-3714	Shazadpur, Ambedkarnagar, U.P.	Monoecious
20	PCPGR-3715	Shivpur, Varanasi, U.P.	Hermaphrodite
21	PCPGR-3716	Budhanpur, Gazipur, U.P.	Hermaphrodite
22	PCPGR-3740	Jaipurbisha, Nainital, Uttarakhand	Monoecious
23	PCPGR-3753	Majera, Nainital, Uttarakhand	Hermaphrodite
24	PCPGR-3774	Bobugar, Dehradun, Uttarakhand	Monoecious
25	PCPGR-5562	Bari Taraya, Gorakhpur, U.P.	Monoecious
26	PCPGR-5563	Faizabad seed company, U.P.	Monoecious
27	PCPGR-5991	Jabalpur, M.P	Hermaphrodite
28	PCPGR-7245	Lucknow, U.P.	Monoecious
29	PCPGR-7247	Lucknow, U.P.	Hermaphrodite
30	PCPGR-7252	Kalyani, West Bengal	Monoecious
31	PCPGR-7253	Kalyani, West Bengal	Monoecious
32	PCPGR-7255	Kanpur, U.P.	Monoecious
33	PCPGR-7261	Kashipur, U.S. Nagar, Uttarakhand	Hermaphrodite
34	PCPGR-7267	Bajpur, U.S.Nagar, Uttarakhand	Monoecious
35	PCPGR-7275	Haridwar, Uttarakhand	Hermaphrodite
36	PCPGR-7333	IIHR, Banglore	Monoecious
37	PCPGR-7369	Bajnath, Almora, Uttarakhand	Monoecious
38	PCPGR-7446	Durga Beej Bhandar, Gorakhpur, U.P.	Monoecious
39	PCPGR-7447	Ramlakhan, Gola baraj, Gorakhpur, U.P.	Monoecious
40	PCPGR-7448	Sikriganj, Gorakhpur, U.P.	Monoecious
41	Pant Torai- 1 (check)	VRC, Pantnagar, Uttarakhand	Monoecious
42	Satputia (check)	RAU, Samastipur, Bihar	Hermaphrodite

Table 2: Analysis of variance (ANOVA) for different characters of ridge gourd genotypes (summer season, 2013)

SI. No.	Characters	Mean sum square			
		Total (9)	Block (4)	Check (1)	Error (4)
1	Node number to first female flower	20.85	1.68	18.52**	0.64
2	Days to first female flower anthesis	232.20	3.15*	228.68**	0.38
3	Days to first fruit harvesting	146.89	5.20*	140.70**	0.99
4	Fruit length (cm)	101.59	2.82	97.97**	0.80
5	Fruit diameter (cm)	16.78	0.36	16.12**	0.29
6	Fruit flesh thickness (cm)	0.0232	0.00014	0.0230**	0.000060
7	Average fruit weight (g)	2778.72	2.02	2774.89**	1.80
8	Main vine length (m)	25.63	0.38	25.02**	0.22
9	Number of primary branches	1.63	0.52	0.25**	0.87
10	Number of fruits per plant	12.03	1.26	9.58**	1.18
11	Fruit yield (q/ha)	1283.97	0.34	1283.47**	0.15
12	Seed length(cm)	0.0234	0.000240	0.0230**	0.000158
13	Seed width(cm)	0.04009	0.0000405	0.0396**	0.000359
14	Number of seeds/fruit	78.37	5.92	67.95**	4.49
15	100 seed weight(g)	3.05	1.67	0.40	0.99

* Significant at 5% level of probability
** Significant at 1% level of probability
Degree of freedom are shown in parenthesis

Table 3: The general mean, range of variation and per cent range of variation of ridge gourd genotypes (summer season, 2013)

SI. No.	Characters	General mean	Range	% Range variation
1	Node number to first female flower	9.93	3.73-16.14	100-432.70
2	Days to first female flower anthesis	46.04	35.86-56.23	100-156.80
3	Days to first fruit harvesting	52.77	42.96-62.58	100-145.68
4	Fruit length (cm)	13.13	5.34-20.92	100-391.76
5	Fruit diameter (cm)	3.87	2.27-5.47	100-240.96
6	Fruit flesh thickness (cm)	0.294	0.174-0.414	100-237.93
7	Average fruit weight (g)	97.95	41.01-154.90	100-377.81
8	Main vine length (m)	6.59	3.96-9.22	100-232.82
9	Number of primary branches	4.07	2.60-5.54	100-213.07
10	Number of fruits per plant	12.23	4.60-19.87	100-431.95
11	Fruit yield (q/ha)	68.07	16.82-119.33	100-709.45
12	Seed length(cm)	1.047	0.714-1.38	100-193.27
13	Seed width(cm)	0.673	0.528-0.818	100-154.92
14	Number of seeds/fruit	73.87	15.16-132.59	100-874.60
15	100 seed weight(g)	10.14	5.25-15.04	100-286.47

Table 4: Mean, range and least significant differences for ridge gourd genotypes (summer season, 2013)

SI. No.	Characters	General mean	Range	Checks		CV%	CM	AVSB	AVDB	AVAC
				Pant Torai-1	Satputia					
1	Node number to first female flower	9.93	3.73-16.14	7.83	5.11	6.18	0.70	1.56	1.91	1.48
2	Days to first female flower anthesis	46.04	35.86-56.23	49.16	39.60	0.696	0.54	1.20	1.48	1.14
3	Days to first fruit harvesting	52.77	42.96-62.58	56.58	49.08	0.941	0.86	1.94	2.38	1.84
4	Fruit length (cm)	13.13	5.34-20.92	16.96	10.70	3.24	0.78	1.75	2.15	1.66
5	Fruit diameter (cm)	3.87	2.27-5.47	4.67	2.13	7.95	0.47	1.05	1.29	1.00
6	Fruit flesh thickness (cm)	0.294	0.174-0.414	0.312	0.216	1.46	0.67	0.15	0.18	0.14
7	Average fruit weight (g)	97.95	41.01-154.90	124.96	91.64	0.62	1.17	2.62	3.21	2.49
8	Main vine length (m)	6.59	3.96-9.22	4.82	7.98	3.65	0.40	0.91	1.12	0.86
9	Number of primary branches	4.07	2.60-5.54	4.72	5.04	9.52	0.81	1.81	2.22	1.72
10	Number of fruits per plant	12.23	4.60-19.87	14.01	15.97	3.63	0.95	2.12	2.60	2.01
11	Fruit yield (q/ha)	68.07	16.82-119.33	96.69	74.04	0.23	0.34	0.77	0.94	0.73
12	Seed length(cm)	1.047	0.714-1.38	1.18	1.08	0.55	0.11	0.24	0.30	0.23
13	Seed width(cm)	0.673	0.528-0.818	0.812	0.686	1.26	0.16	0.37	0.45	0.35
14	Number of seeds/fruit	73.87	15.16-132.59	102.77	97.55	1.05	1.85	4.14	5.07	3.93
15	100 seed weight(g)	10.14	5.25-15.04	10.80	10.40	4.69	0.87	1.94	2.38	1.84

CM=Least significant difference between the means of two checks varieties,
AVSB= Least significant difference between adjusted values of two selections in the same block,
AVDB= Least significant difference between adjusted values of two selections in different block,
AVAC= Least significant difference between adjusted selection value and a check mean,

Table 5: List of promising monoecious genotypes in respect of various characters (summer season, 2013)

SI. No.	Characters	Genotypes	Value
1	Node number to first female flower	PCPGR-7447	16.14
		PCPGR-7333	14.02
		PCPGR-5563	11.21
		PCPGR-7446	10.64
		Pant Torai-1(Check)	7.83
2	Days to first female flower anthesis	PCPGR-5562	48.54
		PCPGR-7446	47.79
		PCPGR-3112	47.23
		PCPGR-5563	45.87
		Pant Torai-1(Check)	49.16
3	Days to first fruit harvesting	PCPGR-7446	54.20
		PCPGR-3112	53.58
		PCPGR-5563	53.50
		PCPGR-7253	51.80
		Pant Torai-1(Check)	56.58
4	Fruit length (cm)	PCPGR-7267	20.92
		PCPGR-7448	19.26
		PCPGR-3055	18.85
		GP 2014-1	18.77
		Pant Torai-1(Check)	16.96
5	Fruit diameter (cm)	PCPGR-7255	5.47
		PCPGR-7448	4.55
		PCPGR-3112	4.44
		PCPGR-3055	4.16
		Pant Torai-1(Check)	4.67

6	Fruit flesh thickness (cm)	PCPGR-7255	0.414
		PCPGR-7448	0.354
		PCPGR-7245	0.304
		PCPGR-3705	0.284
		Pant Torai-1(Check)	0.312
7	Average fruit weight (g)	PCPGR-7267	154.90
		PCPGR-7448	140.04
		PCPGR-7369	130.97
		GP 2014-1	130.77
		Pant Torai-1(Check)	124.96
8	Main vine length (m)	PCPGR-3111	9.22
		PCPGR-5562	8.81
		GP 2014-1	8.26
		PCPGR-7253	8.17
		Pant Torai-1(Check)	4.72
9	Number of primary branches	PCPGR-5562	5.45
		GP 2014-1	5.29
		PCPGR-3111	5.15
		PCPGR-7267	5.02
		Pant Torai-1(Check)	4.82
10	Number of fruits per plant	PCPGR-3711	18.52
		PCPGR-3704	17.73
		PCPGR-3233	17.31
		PCPGR-7447	15.60
		Pant Torai-1(Check)	14.01
11	Fruit yield (q/ha)	PCPGR-3711	119.33
		PCPGR-3233	115.44
		PCPGR-3704	113.31
		PCPGR-7267	106.47
		Pant Torai-1(Check)	96.69
12	Seed length(cm)	GP 2014-1	1.38
		PCPGR-7253	1.35
		PCPGR-7447	1.29
		PCPGR-7245	1.26
		Pant Torai-1(Check)	1.18
13	Seed width(cm)	PCPGR-7253	0.818
		PCPGR-7252	0.814
		PCPGR-5563	0.809
		PCPGR-5562	0.807
		Pant Torai-1(Check)	0.812
14	Number of seeds/fruit	PCPGR-7447	132.59
		PCPGR-7369	120.59
		PCPGR-7446	117.59
		PCPGR-7448	110.74
		Pant Torai-1(Check)	102.77
15	100 seed weight(g)	GP 2014-1	15.04
		PCPGR-3708	14.77
		PCPGR-7447	14.28
		PCPGR-3055	13.42
		Pant Torai-1(Check)	10.80

Table 6: List of promising hermaphrodite genotypes in respect of various characters (summer season, 2013)

SI. No.	Characters	Genotypes	Value
1	Node number to first female flower	PCPGR-3234	8.40
		PCPGR-7261	7.85
		PCPGR-3716	7.04
		PCPGR-7275	6.59
		Satputia(Check)	5.11
2	Days to first female flower anthesis	PCPGR-3715	39.56
		PCPGR-7261	38.19
		PCPGR-7247	37.92
		PCPGR-2264	37.89
		Satputia(Check)	39.60
3	Days to first fruit harvesting	PCPGR-3239	48.41
		PCPGR-3715	48.15
		PCPGR-5991	47.71
		PCPGR-3235	47.04
		Satputia(Check)	49.08
4	Fruit length (cm)	PCPGR-7261	12.10
		PCPGR-3716	9.07
		PCPGR-3700	8.77

		PCPGR-3234	7.52
		Satputia(Check)	10.70
5	Fruit diameter (cm)	PCPGR-5991	3.70
		PCPGR-3700	3.52
		PCPGR-3234	3.42
		PCPGR-2264	3.15
		Satputia(Check)	2.13
6	Fruit flesh thickness (cm)	PCPGR-3716	0.244
		PCPGR-3700	0.240
		PCPGR-5991	0.229
		PCPGR-3234	0.223
		Satputia(Check)	0.216
7	Average fruit weight (g)	PCPGR-7261	91.64
		PCPGR-3715	78.55
		PCPGR-3239	74.47
		PCPGR-3235	62.07
		Satputia(Check)	91.64
8	Main vine length (m)	PCPGR-3239	6.93
		PCPGR-3702	6.46
		PCPGR-3715	6.13
		PCPGR-7261	6.11
		Satputia(Check)	5.04
9	Number of primary branches	PCPGR-7261	5.54
		PCPGR-3239	5.40
		PCPGR-3715	4.90
		PCPGR-3700	4.34
		Satputia(Check)	7.98
10	Number of fruits per plant	PCPGR-3716	19.87
		PCPGR-3702	17.86
		PCPGR-3700	17.66
		PCPGR-7275	16.74
		Satputia(Check)	15.97
11	Fruit yield (q/ha)	PCPGR-3716	63.43
		PCPGR-7275	51.79
		PCPGR-3702	49.45
		PCPGR-3700	45.51
		Satputia(Check)	74.04
12	Seed length(cm)	PCPGR-7275	1.094
		PCPGR-3234	1.092
		PCPGR-3715	1.090
		PCPGR-7261	1.088
		Satputia(Check)	1.086
13	Seed width(cm)	PCPGR-3716	0.778
		PCPGR-3239	0.729
		PCPGR-3234	0.725
		PCPGR-7261	0.719
		Satputia(Check)	0.708
14	Number of seeds/fruit	PCPGR-3753	95.16
		PCPGR-3715	87.94
		PCPGR-7261	73.44
		PCPGR-2264	62.16
		Satputia(Check)	97.55
15	100 seed weight(g)	PCPGR-7247	12.37
		PCPGR-3700	11.03
		PCPGR-3234	10.67
		PCPGR-3702	10.56
		Satputia(Check)	10.40

Table 7: simple phenotypic correlation coefficient between different characters of ridge gourd genotypes

SI. No.	Characters	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Node number to first female flower	1.000	0.658**	0.657**	0.204	0.091	0.198	0.346*	0.155	0.147	-0.155	0.136	0.143	0.179	0.384*	0.340*
2	Days to first female flower anthesis		1.000	0.972**	0.140	0.072	0.094	0.295	0.071	0.122	-0.239	0.047	0.226	0.224	0.514**	0.180
3	Days to first fruit harvesting			1.000	0.095	0.020	0.053	0.252	0.079	0.101	-0.204	0.056	0.193	0.250	0.503**	0.175
4	Fruit length				1.000	0.521**	0.560**	0.765**	-	0.000	-0.031	0.565**	0.604**	0.330*	0.357*	0.384*

	(cm)								0.020							
5	Fruit diameter (cm)					1.000	0.718**	0.619**	0.005	-0.118	-0.299	0.169	0.320*	0.383*	-0.065	0.418**
6	Fruit flesh thickness (cm)						1.000	0.481**	0.053	0.047	-0.100	0.236	0.353*	0.319*	0.146	0.374*
7	Average fruit weight (g)							1.000	0.249	0.094	-0.312*	0.481**	0.590**	0.494**	0.365*	0.508**
8	Main vine length (m)								1.000	0.682**	-0.272	-0.045	0.293	0.189	0.043	0.258
9	Number of primary branches									1.000	-0.084	0.069	0.131	0.150	0.121	0.019
10	Number of fruits per plant										1.000	0.639**	-0.045	-0.209	-0.115	-0.071
11	Fruit yield (q/ha)											1.000	0.379*	0.102	0.221	0.258
12	Seed length(cm)												1.000	0.662**	0.267	0.641**
13	Seed width(cm)													1.000	0.182	0.499**
14	Number of seeds/fruit														1.000	0.150
15	100 seed weight(g)															1.000

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