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Research Note

Per se performance of cluster bearing, glossy purple Brinjal (*Solanum melongena* L.) hybrids for economic traits

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Abstract
An investigation was carried out in brinjal (*Solanum melongena* L.) to develop F_1 hybrids with cluster bearing and glossy purple fruits. A total number of eight genotypes *viz*., Poiyur Purple, Ujala, Yendhal, Pusa Purple Cluster, PLR 1, Hybrid Derivative 1, Hybrid Derivative 2 and Hybrid Derivative 3 were chosen as parents and they were crossed in a 'Full diallel mating design' to get fifty six cross combinations. All the fifty six F_1 hybrids and the eight parents were evaluated for thirteen characters. Based on the *per se* performance, the parent HD 3 was found to be the best for plant height, number of branches per plant, earliness, number of fruiting clusters per plant, number of fruits per plant, fruit yield per plant, whereas PPC followed by HD 1 and HD 2 excelled for number of flowers per cluster, number of fruits per cluster and fruit length. Among the hybrids, the hybrid PLR 1 x HD 3 registered the maximum *per se* for plant height, number of branches per plant, earliness, fruiting clusters per plant, fruit yield per plant and number of solitary fruits per plant followed by the hybrid PPC x HD 3 which had the highest number of flowers per cluster, number of fruits per cluster and solasodine content and HD 1 x HD 3 recorded the maximum number of fruits per plant. The hybrids PPC x HD 2 and Yendhal x HD 3, also showed favourable performance for yield and economic traits.

Keywords: Brinjal, hybrids, *per se* performance, purple, fruit yield

Brinjal (*Solanum melongena* L.) also known as eggplant, belonging to the family solanaceae is one of the popular vegetable crops grown in India and other parts of the world. It originated in its wild form in Indo-Burma region and probably might be a native of India being under cultivation since prehistoric times. It is an important source of fibre (1.3 g/100g), protein (1.4 g/100g), vitamin-A (124 I.U) and potassium (200 mg/100g) and is recommended even for patients with diabetes, asthma, cholera and bronchitis. In Tamil Nadu, brinjal crop is raised during summer as well as in rainy season to meet the market demands throughout the year. It is grown in all most all the districts and extensively in Coimbatore, Dindigul, Salem, Cuddalore, Kancheepuram, Madurai, Namakkal, Thirunelveli, Thiruvallur, Tiruvannamalai and Erode districts. In these districts consumers prefer purple coloured small sized fruits. In most of the regions of Tamil Nadu, purple with medium sized fruits are preferred. Generally purple fruits without glossy surface are found in markets, while, Coimbatore, Erode and Dindugal markets in Tamil Nadu demand only purple coloured fruits with glossiness. The food items commonly prepared in these regions are *poriyal, brinjal sambar, brinjal curry, chutney, smashed brinjal, stuffed brinjal fry, vegetable kebab brinjal fry,* etc. Medium and small sized fruits are preferred to prepare these dishes and such fruits are found more in clusters than as solitary fruit.

The available local cultivars under present cultivation suffer from low productivity and susceptibility to pests and diseases. Hence, there is a need to improve the present cultivars or to develop superior hybrids with high yield and quality and also resistance / tolerance to pests and diseases. Cluster bearing is also one of the important characters in brinjal for increasing the yield. Brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) is a serious pest which causes up to 70 per cent yield loss by boring into young tender shoots and fruits. Exploitation of hybrid vigour for resistance / tolerance to shoot and fruit borer is another important tool to increase the yield.

The present investigation was carried out in the Department of Vegetable Crops, University Orchard, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during the year 2011-2012 with the objectives of developing superior F_1 hybrids with cluster bearing and glossy purple fruits combined with high yield, quality and resistant to shoot and fruit borer. A total number of eight genotypes *viz*, Poiyur Purple, Ujala, Yendhal, Pusa Purple Cluster, PLR 1, Hybrid Derivative 1, Hybrid Derivative 2 and Hybrid Derivative 3 chosen as parents and crosses were made in all possible combinations to obtain fifty six F_1 hybrids. Nursery was raised and 30 days old seedlings of parents and resultant hybrids were transplanted in the main field under drip fertigation system under Randomized Block Design with two replications. Application of inputs and required intercultural operations were carried out periodically. The parents and hybrids were evaluated for sixteen characters *viz*., plant height, number of branches per plant, days to 50 per cent flowering, days to first harvest, number of flowers per cluster,

number of fruits per cluster, number of fruiting clusters per plant, number of solitary fruits per plant, fruit length, fruit girth, fruit weight, number of fruits per plant, fruit yield per plant, shoot borer infestation, fruit borer infestation and marketable yield per plant.

Plant height (cm): The results of the present study showed that among the parents the highest plant height of 87.25cm was recorded in HD 3 (Table 1) and among the hybrids 90.90 cm by PLR 1 x HD 3. Similar results for increased plant height was recorded by Kamalakkannan *et al.* (2007), Voddoria *et al.* (2007), Shafeeq *et al.* (2007), Chowdhury *et al*. (2010), Kalpana Dahatonde *et al.* (2010) and Satesh Kumar *et al*. (2011).

Number of branches per plant: The maximum number of branches per plant (10.30) was recorded by the parent HD 3 and the hybrid PLR 1 x HD 3 (12.30).Three parents and twenty seven hybrids were found to be significantly superior to the grand mean values observed. More number of branches was also observed by Kamalakkannan *et al.* (2007), Voddoria *et al.* (2007), Kalpana Dahatonde *et al.* (2010) and Satesh Kumar *et al*. (2011).

Days to 50 percent flowering: The parent HD 3 (43.35 days) and the hybrid combination PLR 1 x HD 3 (40.15 days) and PPC x HD 3 (40.25 days) were earliest to record 50 per cent flowering. Earliness was also reported by Paikra *et al.* (2003), Omkar Singh and Kumar (2005), Chowdhury *et al.* (2010) and Kalpana Dahatonde *et al.* (2010).

Days to first harvest: The minimum number of 54.85 days was taken for first harvest by HD 3 among the parents and 51.40 days by PLR 1 x HD 3 among the hybrids. The hybrids HD 1 x HD 3 (53.06 days), PPC x HD 3 (53.30 days), PPC x HD 2 (53.55 days) and Yendhal x HD 3 (53.83 days) were early to harvest. Similar findings were registered by Omkar singh and Kumar (2005), Kamal Deep *et al.* (2006), Suneetha *et al.* (2006), Vaddoria *et al.* (2007) and Chowdhury *et al.* (2010)

Number of flowers per cluster: Among the parents, the highest number of flowers per cluster was observed in PPC (6.37) and among the hybrids in PPC x HD 3 (6.35), followed by PPC x HD 1 (5.85), PPC x HD 2 (5.73) and PLR 1 x HD 3 (5.69). These results are in accordance with the findings of Omkar Singh and Kumar (2005) and Shafeeq *et al.* (2007).

Number of fruits per cluster: The highest number of fruits per cluster was recorded in PPC (5.06) and HD 3 (4.14) among the parents. Among the hybrids, maximum number of fruits were observed in PPC x HD 3 (4.86) and PLR 1 x HD 3 (4.55). The hybrids PPC x HD 2 (4.37) and HD 1 x HD 3 (4.35) were also found to produce more number of fruits per cluster. This result in confirmation with the results of Omkar Singh and Kumar (2005), Shafeeq *et al.* (2007) and Kalpana Dahatonde *et al.* (2010).

Number of fruiting clusters per plant: The range of 19.26 (PPC) to 25.46 (HD 1) was observed for number of fruiting clusters per plant in the parental lines. The highest number of fruiting clusters was recorded by the cross PLR 1 x HD 3 (27.51). The other hybrids showed more number of fruiting clusters were HD 1 x HD 3 (27.47) and PPC x HD 2 (25.83).

Number of solitary fruits per plant: Less number of solitary fruit formation helps increased number of fruits in clusters. Among the parents, the mean performance for number of solitary fruits per plant varied from 7.31 in HD 3 to 12.59 in PLR 1. Among the hybrids, it was less in 8.16 (PLR 1 x HD 3). The cross combinations PLR 1 x HD 3 (8.16), PPC x HD 3 (8.18), PPC x HD 2 (8.23) and HD 1 x HD 3 (8.24) also recorded least solitary fruits per plant.

Fruit length (cm): The maximum fruit length of 9.55 cm was recorded in the parent PPC. Among the hybrids it was the highest in HD 3 x PLR 1 (9.45 cm). Similar findings were recorded for long fruits by Paikra *et al.* (2003), Kamal Deep *et al.* (2006), Chowdhury *et al.* (2010), Kalpana Dahatonde *et al.* (2010) and Satesh kumar *et al.* (2011).

Fruit girth (cm): The fruit girth was maximum in Poiyur Purple (14.10 cm) and Yendhal (13.70 cm) among the parents and the hybrid Poiyur Purple x Ujala (13.50 cm) (Table 10). Same trend of results were registered by (Praneetha, 2002), (Thangamani, 2003), Chowdhury *et al.* (2010), Kalpana Dahatonde *et al.* (2010) and Satesh Kumar *et al.* (2011).

Fruit weight (g): The fruit weight ranged from 52.35 g (HD 3) to 77.85 g (Yendhal) among the parents. The highest value was recorded in the cross HD 3 x Poiyur Purple (74.06 g) among the hybrids. This result is in confirmation with Shafeeq *et al.* (2007), Chowdhury *et al.* (2010), Kalpana Dahatonde *et al.* (2010) and Satesh Kumar *et al.* (2011).

Fruits per plant: Among the parents, the highest number of 79.38 fruits per plant was recorded by HD 3 and 89.90 in the hybrid HD 1 x HD 3 followed by 89.94 in PLR 1 x HD 3 and 89.03 in PPC x HD 3. This findings are in accordance with (Praneetha, 2002), Chowdhury *et al.* (2010), Kalpana Dahatonde *et al.* (2010) and Satesh Kumar *et al. (*2011).

Fruit yield per plant (kg): The maximum fruit yield per plant among the parents ranged from 2.53 kg (Yendhal) to 4.22 kg (HD 3), while it ranged from 1.27 kg (Poiyur Purple x Yendhal) to 4.41 kg (PLR 1 x HD 3) among the hybrids. Similar results for yield ranges were registered by Praneetha (2002), Suneetha *et al.* (2006) and Kalpana Dahatonde *et al.* (2010).

Shoot borer infestation (%): The lowest shoot borer infestation was noticed in HD 1 (6.23 per cent) among the parents (Table 14). The hybrid PPC x HD 3 recorded the lowest incidence (6.51 per cent) followed by HD 1 x HD 3 (6.61 per cent) and PLR 1 x HD 3 (6.96 per cent). The lowest fruit borer infestation (9.78 per cent) was recorded in HD. The hybrids PPC x HD 3 (11.59 per cent), PLR 1 x HD 3 (11.85 per cent), HD 1 x HD 3 (12.18 per cent) and PPC x HD 2 (12.33 per cent) recorded lesser borer infestation among the hybrids. The lowest shoot and fruit borer infestation was reported by Praneetha (2002), Kamalakkannan *et al.* (2007) and Kalpana Dehatonde *et al.* (2010).

Marketable yield per plant (kg): Among the parents, the highest marketable yield per plant (4.03 kg) was recorded in HD 3 (4.13kg) and it was maximum in PLR 1 x HD 3. Similar findings were reported by Praneetha (2002), Thangamani (2003) and Prabhu (2004).

Based on the *per se* performance, the parent HD 3 and hybrids PLR 1 X HD 3, HD 1 X HD 3, PPC X HD 3, PPC X HD 2 and Yendhal X HD 3 recorded significantly higher marketable fruit yield than the check COBH 2 (3.50 kg). These hybrids also recorded superior performance for other yield component traits. Though the fruit borer infestation is on par with all these promising entries with check COBH 2, these entries recorded significantly lesser incidence of shoot borer infestation. Hence the promising the parent HD 3 and hybrids PLR 1 X HD 3, HD 1 X HD 3, PPC X HD 3, PPC X HD 2 and Yendhal X HD 3 can be evaluated over locations and in larger plots to recommend for release.

References

Chowdhury. M. J., S. Ahmad, M. Nazim Uddin, A. K. M. Quaruzzaman and M. M. A. Patway. 2010. Expression of heterosis for productive traits in F_1 brinjal (*Solanum melongena* L.) hybrids. *Agriculturists,* **8**(2): 8-13.

Kalpana Dahatonde, V.N. Dod, P.K. Nagre and A.P.Wag. 2010. Genetic Variability in purple fruited brinjal. *Asian J. Hort.,* **5**(2): 367-370.

Kamal Deep, S.S. Bal, Ajay Kumar and A.S.Sidhu. 2006. Heterosis and combining ability studies in brinjal (*Solanum melongena* L.). *Haryana J. Hort. Sci.,* **35** (1&2): 161-165.

Kamalakkannan, T., P. Karuppaiah, K. Sekar and P. Senthilkumar. 2007. Line x tester analysis in brinjal for yield and shoot and fruit borer tolerance. *Indian J. Hort., 64*(4): 420-424.

Omkar Singh and J. Kumar. 2005. Variability, heritability and genetic advance in brinjal. *Indian J. Hort.,* **62**(3): 265-267.

Paikra, M.S., P.N. Singh and Nandan Mehta. 2003. Evaluation of round fruited F1 hybrids of brinjal (*Solanum melongena* L.) for Chhattisgarh plains. *Haryana J. Hort. Sci.,* **32** (3&4): 291-292.

Prabhu, M. 2004. Breeding for high yield with shoot and fruit borer (*Leucinodes orbonalis* guen.) resistance in brinjal (*Solanum melongena* L.). Ph.D., (Hort.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Praneetha, S. 2002. Breeding for shoot and fruit borer (*Leucinodes orbonalis* G.) resistance in brinjal (*Solanum melongena* L.). Ph.D. (Hort.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Satesh Kumar, J.P. Sharma and Sandeep Chopra. 2011. Studies on variability, heritability and genetic advance for morphological and yield traits in brinjal (*Solanum melongena* L.). *Mysore J. Agric. Sci.,* **45**(1): 63-66.

Shafeeq, A., K.Madhusudan, R.R. Hanchinal, A.G.Vijayakumar and P.M.Salimath. 2007. Heterosis in brinjal. *Karnataka J. Agric. Sci.,* **20**(1): 33-40.

Suneetha, Y., K.B. Kathiria, P.K. Kathiria and T. Srinivas. 2006. Studies on heterosis for yield, quality and physiological characters in summer brinjal. *Crop Res.,* **31** (1): 120-124.

Thangamani, C. 2003. Evaluation of F_1 brinjal (*Solanum melongena* L.) for yield and quality. MSc. (Hort.) thesis, Tamil Nadu Agricultural University, Coimbatore

Vaddoria, M. A., K.L. Dobariya, V.J. Bhatiya and D.R. Mehta. 2007. Hybrid vigour for earliness and plant stature in brinjal (*Solanum melongena* L.). *Orissa J. Hort.,* **35**(2): 97-104.

Table 1. *Per se* performance of hybrids and their parents for various traits

Hybrids/ Parents	Plant height (cm)	Number of branches per plant	Days to 50 per cent flowering	Days to first harvest	Number of flowers per cluster	Number of fruits per cluster	Number of fruiting clusters per plant	Number of solitary fruits per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Number of fruits per plant	Fruit yield per plant (kg)	Shoot borer infestation (%)	Fruit borer infestation (%)	Marketable yield per plant (kg)
PLR 1 X HD 3	90.9	12.3	40.2	51.4	5.7	4.6	27.5	8.2	8.9	9.5	50.2	89.8	4.4	7.0	11.9	4.1
HD 3	87.3	10.3	43.4	54.9	5.7	4.1	25.2	7.3	8.4	11.9	52.4	79.4	4.2	6.8	9.8	4.0
HD 1 X HD 3	81.0	10.3	41.9	53.1	5.6	4.4	27.5	8.2	7.1	8.5	53.5	89.9	4.4	6.6	12.2	4.0
PPC X HD 3	90.1	10.0	40.3	53.3	6.4	4.9	25.7	8.2	9.2	10.3	51.5	89.0	4.3	6.5	11.6	3.9
PPC X HD 2	88.2	9.8	41.4	53.6	5.7	4.4	25.8	8.2	8.4	10.0	50.2	85.2	4.3	7.1	12.3	3.8
Yendhal X HD3	87.3	9.6	43.2	53.8	5.3	4.0	25.5	9.0	9.1	12.2	55.3	73.7	4.0	7.9	13.7	3.8
COBH 2 (chk)	82.3	8.3	58.7	67.5	4.1	2.9	24.2	10.2	8.3	11.5	57.7	60.7	3.6	8.7	12.3	3.5
Ujala X HD 3	85.5	8.3	50.9	61.9	5.3	3.7	24.1	11.5	7.8	11.4	57.0	66.0	3.8	8.2	14.0	3.5
HD 1	73.9	8.5	46.7	58.4	3.6	3.3	25.5	10.4	8.4	12.9	58.9	59.4	3.7	6.2	12.7	3.3
PPC	71.9	8.2	61.8	74.3	6.4	5.1	19.3	8.6	9.6	9.5	53.8	62.7	3.4	7.7	13.8	3.3
HD 2	79.1	7.3	47.6	59.9	4.4	3.3	23.5	9.5	8.2	11.3	58.1	57.7	3.3	7.4	10.2	3.1
Ujala	71.0	8.6	52.4	62.3	3.9	3.9	21.8	8.7	7.1	10.6	54.3	59.6	3.1	10.3	19.5	2.9
Ujala X HD 2	81.9	7.8	54.4	60.1	4.3	3.3	23.3	12.3	8.0	12.5	58.7	55.8	3.3	9.5	14.2	2.9
PLR 1	82.0	9.6	56.5	70.1	4.5	3.0	23.5	12.6	6.7	12.1	64.7	46.8	3.0	8.0	21.3	2.9
Poiyur Purple	83.0	9.3	48.2	58.3	4.4	2.2	23.3	9.7	8.0	14.1	74.8	39.9	3.0	11.9	20.2	2.8
HD3 X Yendhal	84.6	7.5	55.9	66.9	5.1	3.6	23.9	12.5	8.5	11.6	54.8	53.4	2.9	8.3	14.2	2.6
Poiyur Purple X HD 3	88.5	8.8	48.2	60.8	3.7	3.2	21.6	12.5	8.4	11.9	69.9	41.3	2.9	9.7	14.7	2.5
Ujala X PPC	81.1	6.6	58.0	67.9	4.8	3.4	22.5	10.2	8.4	11.1	52.8	51.6	2.7	8.5	14.6	2.4
Yendhal	74.8	8.6	59.9	72.4	3.5	1.5	24.0	11.3	8.3	13.7	77.9	32.0	2.5	11.2	21.4	2.4
HD 3 X Poiyur Purple	83.6	8.3	48.5	59.5	4.7	2.5	22.1	12.4	9.2	13.4	74.1	36.3	2.7	9.2	18.9	2.3
HD 3 X Ujala	86.9	9.3	52.5	64.6	4.5	3.6	23.3	11.3	8.3	12.6	48.3	54.8	2.6	9.5	15.5	2.3
Ujala X PLR 1	77.0	9.3	44.5	55.4	4.9	3.4	23.4	11.5	7.1	10.4	48.2	51.9	2.5	11.4	15.0	2.2
PPC X HD 1	88.7	8.9	44.5	55.7	5.9	3.8	20.2	9.3	7.6	9.5	48.9	50.9	2.5	8.1	14.2	2.2
PLR 1 X HD 1	74.1	7.7	60.9	70.9	4.5	3.1	20.4	11.1	8.3	10.7	62.9	39.7	2.5	7.4	15.6	2.2
PPC X Poiyur Purple	77.0	6.4	57.0	67.3	4.3	3.9	21.5	10.5	7.6	10.4	49.1	52.8	2.6	11.4	17.1	2.2
Yendhal X PPC	72.9	6.7	61.0	71.0	4.6	3.0	23.2	10.6	6.4	8.5	50.9	48.5	2.5	9.6	15.8	2.1
PPC X Yendhal	79.0	8.4	62.0	72.1	4.2	3.6	19.4	9.3	7.2	10.7	55.7	46.1	2.6	10.5	23.4	2.1
HD 3 X HD 2	78.8	9.0	44.5	57.1	4.3	3.1	20.4	10.4	7.7	12.6	57.2	41.5	2.4	7.6	14.7	2.1
PLR 1 X PPC	79.7	9.3	45.7	56.4	5.4	3.6	20.1	11.4	8.5	11.2	53.0	43.3	2.3	9.3	15.1	2.0
Poiyur Purple X HD 2	85.2	8.2	47.9	58.9	4.2	2.4	22.3	13.3	7.1	10.4	68.4	34.6	2.4	9.6	16.7	2.0
HD 1 X Poiyur Purple	81.8	7.4	48.7	59.6	3.3	2.6	19.4	10.4	7.6	11.1	72.5	34.2	2.5	10.3	23.4	2.0
HD 3 X PPC	78.7	9.5	43.4	55.4	3.6	3.2	22.5	11.3	9.3	10.7	49.4	47.2	2.3	7.7	20.9	2.0

Contd..

Table 1. contd.

Hybrids/ Parents	Plant height (cm)	Number of branches per plant	Days to 50 per cent flowering	Days to first harvest	Number of flowers per	Number of fruits	Number of fruiting clusters per	Number of solitary fruits per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Number of fruits per plant	Fruit yield plant per	Shoot borer infestation (%)	Fruit borer infestation (%)	Marketable yield per
HD 1 X PLR 1	84.1	9.2	46.7	57.5	5.5	3.0	20.3	10.2	7.7	10.6	53.6	39.9	2.1	10.5	17.6	1.9
Poiyur Purple X HD 1	74.3	8.4	52.0	63.1	3.9	2.6	21.0	12.4	8.3	12.7	63.7	35.0	2.2	8.7	19.7	1.9
PPC X PLR 1	76.1	7.3	47.1	57.5	4.3	3.3	20.1	10.4	6.6	11.4	50.3	42.9	2.2	7.7	17.2	1.8
HD 1 X PPC	81.4	8.4	45.2	57.3	4.4	3.5	19.4	10.2	9.2	10.7	48.5	42.1	2.0	9.4	14.9	1.8
Poiyur Purple X PPC	72.6	7.3	46.1	64.1	4.9	3.2	21.1	10.4	9.1	10.4	49.6	44.3	2.2	8.8	19.4	1.8
Poiyur Purple XUjala	81.8	8.4	55.8	66.8	5.4	2.2	18.8	9.3	8.4	13.5	70.4	29.7	2.1	11.4	18.8	1.8
PLR 1 X Poiyur Purple	79.8	7.3	46.3	56.4	4.5	2.2	19.5	10.3	7.7	11.7	70.2	30.1	2.1	11.3	18.2	1.8
PLR 1 X HD 2	84.0	8.2	52.7	63.9	3.4	2.0	21.9	12.2	7.3	11.3	65.2	31.9	2.1	7.0	14.7	1.8
Poiyur Purple X PLR 1	75.5	7.4	52.8	64.8	3.7	2.2	22.5	11.5	7.2	12.3	60.9	35.7	2.2	7.4	19.4	1.8
Ujala X HD 1	73.5	6.4	45.4	58.6	4.8	2.7	21.8	12.4	8.6	12.2	57.2	37.7	2.2	10.6	22.0	1.8
PLR 1 X Ujala	81.4	6.4	54.4	64.9	3.4	2.3	20.2	9.4	8.4	12.4	62.9	34.4	2.2	10.7	22.0	1.8
HD 2 X PPC	84.9	6.6	44.2	54.9	4.6	2.9	20.6	10.3	7.2	8.4	51.4	39.6	2.0	9.2	16.9	1.7
HD 3 X HD 1	76.1	9.3	51.0	62.8	4.5	3.2	20.9	10.2	8.1	11.2	46.9	44.1	2.1	7.1	17.9	1.7
Ujala X Poiyur Purple	82.2	7.4	51.0	63.0	3.7	2.3	18.2	9.5	8.2	9.7	70.2	29.3	2.1	11.8	16.2	1.7
Yendhal X HD 2	83.3	7.8	57.9	69.0	3.6	1.4	23.4	12.2	8.1	11.4	70.3	28.5	2.0	7.5	18.4	1.7
Yendhal XUjala	81.3	7.2	59.3	69.2	2.8	2.6	16.5	9.6	7.2	11.6	68.4	27.3	1.9	10.8	18.3	1.6
HD 2 X Ujala	73.0	6.3	54.0	65.1	3.6	2.7	20.3	9.2	6.7	8.7	51.0	39.2	2.0	10.4	23.9	1.6
HD 2 X HD 1	80.9	7.6	49.3	60.3	4.3	2.5	20.2	11.2	7.5	11.2	58.4	33.3	1.9	9.6	23.3	1.6
Ujala X Yendhal	74.0	8.9	61.9	71.9	4.4	2.4	19.1	10.5	8.3	12.2	58.2	31.3	1.8	10.6	19.8	1.5
Yendhal X Poiyur Purple	87.0	6.2	53.5	64.5	3.2	1.5	19.6	10.7	7.7	12.4	73.4	24.1	1.8	11.6	19.6	1.5
Yendhal X HD 1	80.9	8.2	48.2	59.1	4.6	1.7	20.4	11.4	8.2	11.7	65.9	26.5	1.7	10.1	19.1	1.5
HD 2 X HD 3	86.6	8.3	44.3	55.3	3.6	2.1	20.4	10.3	8.7	11.5	57.1	31.0	1.8	10.5	20.8	1.5
PPC X Ujala	76.1	5.3	55.3	66.3	3.7	2.7	18.9	10.2	6.5	10.1	51.8	33.3	1.7	12.4	21.9	1.4
HD 1 X HD 2	83.0	8.2	48.1	59.3	4.7	2.1	22.5	10.3	8.3	12.4	50.8	35.4	1.8	7.2	25.4	1.4
HD 1 X Yendhal	75.8	7.4	49.9	60.3	3.5	2.1	17.5	9.6	6.9	8.8	62.8	26.2	1.7	11.4	19.1	1.4
HD 1 X Ujala	65.8	7.2	46.2	57.3	4.7	2.1	19.0	9.7	6.5	8.4	55.3	28.7	1.6	11.2	19.3	1.3
HD 2 X Poiyur Purple	82.9	7.1	48.6	59.7	3.4	1.4	19.4	9.2	7.3	9.5	71.5	22.9	1.6	11.4	24.6	1.3
HD 3 X PLR 1	73.1	6.4	45.6	56.6	3.5	1.7	19.8	9.4	9.5	11.7	55.4	27.1	1.5	10.4	21.6	1.2
HD 2 X Yendhal	76.1	7.4	55.5	66.5	2.8	1.5	19.5	10.4	8.1	11.8	62.8	24.1	1.5	10.7	25.4	1.2
PLR 1 X Yendhal	74.7	6.4	56.7	67.2	3.7	1.4	19.6	10.3	7.4	9.6	60.3	23.3	1.4	10.5	24.5	1.1
HD 2 X PLR 1	82.9	8.2	56.9	67.8	3.3	1.4	21.4	11.4	8.5	12.1	55.3	24.9	1.4	10.6	29.0	1.0
Yendhal X PLR 1	85.4	7.2	52.9	63.9	3.5	1.4	18.4	12.7	6.1	9.3	57.0	21.8	1.2	8.5	26.2	1.0
Poiyur Purple X Yendhal	80.6	6.4	55.0	66.0	4.2	1.2	16.1	9.6	7.1	11.1	73.6	17.2	1.3	13.7	26.8	0.9
S.E.	0.4	0.1	0.4	0.4	0.1	0.1	0.3	0.1	0.1	0.2	0.4	1.6	0.1	0.2	1.7	0.1
C.D.(P=0.05)	1.2	0.3	1.1	1.1	0.4	0.4	0.9	0.3	0.4	0.5	1.1	4.6	0.3	0.5	4.7	0.2