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EVALUATION OF F_1 INTERSPECIFIC HYBRIDS IN VIGNA SPECIES

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Abstract:

For quantitative traits the interspecific cross *V. umbellata* x *V. radiata* exhibited high *per se* performance for many traits like plant height, number of branches per plant, length of branch, number of clusters per branch, number of clusters per plant, hundred seed weight, and dry matter production. For seed yield the hybrid of the cross *V. radiata* x *V. trilobata* registered the highest mean value among the direct crosses.

Key Words: F1- interspecific hybrids evaluation - *Vigna radiata, Vigna radiata var sublobata, Vigna mungo var silvestris, Vigna hainiana, Vigna umbellata, Vigna vexillata and Vigna trilobata*

Introduction:

Vigna radiata (L.) wilczek, commonly known as green gram or mungbean is the most widely distributed species among the six Asiatic *Vigna* species. It is one of the predominant sources of protein and certain essential amino acids like lysine and tryptophan in vegetarian diets. The varietal breeding program taken up in this crop had resulted only with limited success as far as yield improvement is concerned. The basic reason for limited success had been due to the limited variability prevailed among the parents used for hybridization in most of the studies. There had been always possibility of improving the crop by incorporating wild genes to the cultivated species. Stepwise utilization of primary, secondary and tertiary gene pools of this crop can result in tremendous improvement in yield. For utilizing the variability available in the secondary and tertiary gene pools it is essential to attempt interspecific crosses and to develop viable hybrids. These hybrids need to be critically evaluated as such and in the segregating generations for improvement in yield and yield components. The introgressed materials developed through wide crosses can also contribute as genetic reservoirs for novel genes apart from contributing to the improvement of yield and yield components. The objectives for this studies are to generate variability through interspecific hybridization involving *Vigna radiata* with species in secondary and tertiary gene pools, to evaluate and characterize interspecific hybrids and studying the segregants for yield and yield components and to compare the variability created for yield and yield components among segregants generated through interspecific hybridization.

Materials and Methods:

For this study the following species namely *Vigna radiata, Vigna radiata var sublobata, Vigna mungo var silvestris, Vigna hainiana, Vigna umbellata ,Vigna vexillata* and *Vigna trilobata* were employed. Direct crosses with *V. radiata* as female and other six Vigna species as male and vice versa for in direct crosses were programmed. *Vigna radiata* and other six wild *Vigna* species were raised during Rabi 2023-2024 in a crossing block at Dr. M. S. Swaminathan Agricultural College & Research Institute, Tamil Nadu Agricultural University, Eachankottai, Thanjavur, Tamil Nadu- 614 902. The direct and reciprocal crosses were effected following the method suggested by Boling *et al. (*1961) for hybridization. The set seeds from the above mentioned crosses were sown in 2 rows along with one row of male and female parents with a spacing of 45 x 30 cm during summer 2023. The following characters like Plant height (cm), Number of branches per plant, Length of branches (cm), Days to 50 per cent flowering, Number of clusters per branch, Number of clusters per plant, Number of pods per plant, Pod length (cm), Number of seeds per pod, Hundred seed weight (g), Grain yield per plant (g), Dry matter production and Days to full maturity of these quantitative traits were studied for all F_1 hybrids

Result:

The mean performance of parents and their hybrids for 13 quantitative traits recorded in both direct and reciprocal crosses are presented in Table 1. Among parental species *V. umbellata* registered highest value of 67.00 for plant height followed by *V. radiata* (45.50). Among the direct crosses, the hybrid plant of V. *radiata* x *V. radiata* var. *sublobata* was found to be taller (44.00). In the reciprocal crosses the *V. umbellata* x *V. radiata* registered the highest value of 48.50 . Among the parental species *V. trilobata* possessed more number of branches (5.00). The hybrid of the direct cross *V. radiata* x *V. mungo var. silvestris* registered more branches (3.00). The hybrid of the cross *V. hainiana* x *V. radiata* and *V. umbellata* x *V. radiata* registered more branches per plant (4.00) among the reciprocal crosses. *V. umbellata* possessed lengthiest branch (52.00) among parental species. The highest branch length 29.00 was recorded by the hybrid *V. radiata* x *V. radiata* var. *sublobata* among the direct crosses. The hybrids of the cross *V. umbellata* x *V. radiata* registered the maximum branch length of 36.80 as compared to other reciprocal crosses .*V.hainiana* was the earliest to flower with 37 days closely followed by *V.radiata* with 38 days. Among the direct crosses *V. radiata* x *V. vexillata* registered early flowering (38 days) followed by *V. radiata* x *V. hainiana* (39 days). The hybrid of the cross *V. hainiana* x *V. radiata* was earliest to flower (38 days) among reciprocal crosses.

V. trilobata registered the highest value of 8.00 for number of clusters per branch among the seven parental species. V. radiata x V. hainiana and V. radiata x V. vexillata possessed highest number of clusters per branch (3.0) among the direct cross hybrids, while V. radiata var. sublobata x V. radiata, V.hainiana x V. radiata and V. umbellata x V. radiata registered highest value of 3.00 clusters per branch among the reciprocal crosses .The maximum of 12 clusters per plant was observed the parent V. trilobata. The cross V. radiata x V. umbellata recorded the maximum value of 8.00 for this trait among the direct crosses. Three out of six reciprocal hybrids registered the highest value of 8.00 for this trait. For this trait, V. trilobata recorded in the highest value of 55.00 followed by V. radiata 45.00. In the direct cross V. radiata x V. mungo var. silvestris registered more number of pods 35.00, in case of reciprocal crosses highest value of 35.00 was observed in the hybrid V. radiata var. sublobata x V. radiata

The wild parent V. vexillata *recorded 16.50 which was highest value for length of pods.* V. radiata *x* V. vexillata *registered the highest value (8.50) among the direct crosses. The reciprocal crosses of the same combination also recorded the highest value of 15.30. The highest value of 15.50 seeds was observed in the parental species* V. vexillata *followed by* V. radiata *which recorded 12.00 seeds per pod. The hybrid of the cross* V. radiata *x* V mungo *var.* silvestris *recorded (11.00) while the reciprocal hybrid* V. vexillata *x* V. radiata *exhibited highest value of 15.20 for this trait.*

V. umbellata possessed very bold seeds among the parental species registering 5.40 for trait hundred seed weight. *V. radiata* x *V. vexillata* recorded the highest value of 3.20 for this trait among the direct crosses and the other hybrid *V. umbellata* x *V. radiata* performed better with value of 5.50.For this trait the value of 5.85 registered by *V. radiata* was highest among parents. In the direct crosses the value of 15.00 recorded by the hybrid *V. radiata* x *V. trilobata* was highest. In the reciprocal direction the cross *V. vexillata* x *V. radiata* registered the highest value of 5.00.

For dry matter production V. radiata (25.50) registered the highest value among parents. In the direct crosses the value of 20.00 recorded by the hybrids V. radiata x V. vexillata was highest. In the reciprocal crosses V. umbellata x V. radiata revealed highest value of 25.60. V. radiata was the parent to mature earliest at 65 days followed by *V. hainiana* in 66.00 days. The hybrid of the cross *V. radiata x V. vexillata* was shortest in duration with 65 days. The hybrid of the reciprocal cross *V. hainiana x V. radiata* was earliest with 65 days.

Discussion:

The primary criterion used for the evaluation of hybrids was the *per se* performance for different traits. In the present study, among the crosses, the reciprocal cross *V. umbellata x V. radiata* exhibited high mean value for important traits *viz.*, plant height, number of branches per plant, length of branch, number of clusters per branch, number of clusters per plant, hundred seed weight and dry matter production.

The reciprocal cross *V. vexillata x V. radiata* exhibited higher mean performance for characters *viz.*, length of pod, number of pods per plant and single plant yield while the hybrid of direct cross of same parents exhibited high value for three characters in the desirable direction *viz.*, length of pod and days to full maturity and 50 per cent flowering. The hybrid of the direct cross *V. radiata* x *V. radiata* var. *sublobata* recorded high *per se* performance for the characters plant height and length of branch while the higher number of clusters per branch and number of pods per plant were recorded in the reciprocal crosses. Hybrid of the cross *V. radiata* x *V. mungo* var. *silvestris* registered higher number of branches per plant, number of cluster per plant and number of pods per plant. For seed yield the hybrid of the cross *V. radiata* x *V. trilobata* registered the highest mean value among the direct crosses. Hence the segregants that could be recovered from these promising interspecific hybrids might serve as better breeding base for improvement of yield and yield components. Such promising interspecific hybrids were also reported by Umamaheswari (2000), Subramaninan and Muthiah (2001) and Ganeshram (1993).

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Table 1: Mean performance of parents and hybrids both direct and reciprocal crosses

Parents and Hybrids	**PHT**	**NOB**	**BRL**	**DFF**	**NCB**	**NOC**	**NPP**	**POL**	**NSP**	**HSW**	**SPY**	**DMP**	**DFM**
V.radiata	45.5	3.0	38.5	38.0	4.0	10.0	45.0	8.80	12.0	3.8	5.85	25.5	65.0
V.radiata var sublobata	25.8	2.0	15.0	40.0	2.0	5.0	18.0	5.27	6.0	2.5	2.8	9.5	68.0
V.mungo var silvestris	15.0	1.0	10.5	42.0	2.0	8.0	10.0	3.5	5.0	2.5	1.5	4.2	70.0
V .hainiana	29.0	3.0	24.0	37.0	4.0	10.0	25.0	6.50	10.	2.2	4.2	5.8	66.0
V .umbellata	67.0	3.0	52.0	58.0	4.0	10.0	21.0	5.5	4.5	5.4	4.4	18.6	95.0
V .vexillata	25.0	1.0	14.0	55.0	1.0	3.0	8.0	16.5	15.5	4.2	4.8	8.8	85.0
V .trilobata	35.0	5.0	45.0	50.0	8.0	12.0	55.0	5.3	6.0	2.8	3.8	6.5	75.0
V.radiata x V.radiata var. sublobata	44.0	2.0	29.0	42.0	2.0	5.0	30.0	5.5	8.0	2.4	1.5	10.7	70.0
V.radiata x V.mungo var. silvestris	39.0	3.0	15.0	40.0	2.0	7.0	35.0	5.5	11.0	2.0	1.8	4.0	68.0
V. radiata x V. hainiana	27.0	1.0	18.0	39.0	3.0	5.0	29.0	5.8	10.0	2.5	3.8	5.3	69.0
V. radiata x V .vexillata	28.0	2.0	18.0	38.0	3.0	5.0	21.0	8.5	9.0	3.2	3.85	20	65.0
V. radiata x V. trilobata	25.0	2.0	10.0	48.0	2.0	4.0	15.0	7.5	8.0	2.8	15	3.0	68.0
V.radiata var. sublobata x V.radiata	25.3	2.0	18.5	45.0	3.0	8.0	35.0	6.5	8.6	3.5	2.5	15	69.0
V.mungo var . silvestris x V.radiata	18.4	2.0	12.2	48.0	2.0	6.0	26.0	3.2	3.3	2.8	1.8	18.3	72.0
V. hainiana x V.radiata	29.5	4.0	21.5	38.0	3.0	8.0	33.0	6.8	10.2	2.5	3.2	19.5	65.0
V .umbellata x V .radiata	48.5	4.0	36.8	55.0	3.0	8.0	28.0	5.8	6.6	5.5	3.5	25.6	85.0
V . vexillata x V.radiata	20.6	1.0	13.4	58.0	1.0	3.0	6.0	15.3	15.2	5.0	5.0	12.5	92.0
V.trilobata x V.radiata	18.5	1.0	12.5	42.0	2.0	3.0	18.0	4.5	5.0	2.5	2.5	8.0	69.0