International Journal of Computational Research and Development (IJCRD)
International Peer Reviewed - Refereed Research Journal, Website: www.dvpublication.com
Impact Factor: 5.015, ISSN (Online): 2456 - 3137, Volume 10, Issue 1, January - June, 2025

POLLEN FERTILITY OF MALE PARENTS AND THEIR CROSSING ABILITY OF IN FEMALE PARENTS STUDIES AMONG VIGNA SPECIES

Pandiyan Muthaiyan
Independent Research Scholar, School of Science, University of Marlyne, United States of America

Cite This Article: Pandiyan Muthaiyan, "Pollen Fertility of Male Parents and their Crossing Ability of in Female Parents Studies Among Vigna Species", International Journal of Computational Research and Development, Volume 10, Issue 1, January - June, Page Number 86-88, 2025.

Summary:

The highest pollen fertility germination of 73.21 per cent was recorded in *V. radiata* x *V. radiata* var. *sublobata* while the same crosses went on reciprocal fashion has recorded highest for 59.62 per cent in *V. radiata* var. *sublobata* x *V. radiata.* The estimates of pollen fertility was sufficient enough to recover F_2 segregants in all the crosses. Very lowest pollen fertility of 29.93 in *V. radiata* x *V.glabresence* percentage in Vign radiata x Vigna vexillata in direct cross when in reciprocal crosses recoded lowest pollen fertility is 16.43 in *V.glabresence* x *V. radiata*.

Introduction:

Vigna radiata (L.) wilczek, commonly known as greengram or mungbean is the most widely distributed species among the six cultivated Asiatic *Vigna* species. It is one of the predominant sources of protein and certain essential amino acids like lysine and tryptophan in vegetarian diets. Presently, the yield level of greengram as like other pulses is well below the optimum level. The average yield of mungbean is very low not only in India (425 kg/ha) but in entire tropical and subtropical Asia. In Tamil Nadu it is cultivated in an area of 1.63 lakhs hectare with a production of 0.78 lakhs tonnes. Besides management factors the prime cause for the low productivity can be ascribed to the inherently low yielding potential of the cultivars coupled with susceptibility to diseases. Pollen fertility lead high pod set ultimately yield increases.

Materials and Methods:

The pollen fertility analysis was carried out in the parents and their hybrids by acetocarmine staining technique from the trail raised during Kharif 2023-2024 at Dr. M. S. Swaminathan Agricultural College & Research Institute, Tamil Nadu Agricultural University, Eachankottai, Thanjavur, Tamil Nadu - 614 902. Matured anthers were collected from the parents and hybrids and squashed on a microscopic slide with 1:1 acetocarmine glycerol mixture and covered with a coverslip. The slides were observed under compound microscope and pollen counts were taken in five microscoic fields. The swollen and well-stained pollens were counted as fertile, while shrunken and unstained as sterile

$$\text{Pollen fertility} = \frac{\text{No. of viable pollen}}{\text{Total no. of pollen observed}} \times 100$$

Result:

Pollen fertility status of parents and F_1 hybrids in the interspecific crosses of *Vigna* species were studied under compound microscope and the results are furnished in Table 1

***Vigna radiata* x *Vigna radiata* var. *sublobata*:**

The average pollen fertility in the female and male parents was 92.23 and 79.43 per cent respectively. In F_1 plants of *V. radiata x V.radiata* var. *sublobata* fertility was 73.21**.** The F_1 plants of *V.radiata* var. *sublobata* x *V.radiata* had only 52.35 per cent of pollen fertility

***Vigna radiata x Vigna mungo* var. *silvestris*:**

The pollen fertility of direct cross hybrid was 63.00 as compared to the male and female parents of 92.23 and 73.74 per cent respectively. In reciprocal cross the pollen fertility was very low of 15.00 per cent

***Vigna radiata* x *Vigna hainiana*:**

The direct cross showed 59.25 per cent pollen fertility while reciprocal exhibited 38.33 per cent. The parents *V. hainiana* recorded the value of 81. 75 per cent

***Vigna radiata* x *umbellate*:**

Pollen fertility was found to be 87.84 per cent and 82.58 in mungbean and rice bean respectively. In the reciprocal it was found to be 40.11 per cent.

***Vigna radiata* x *Vigna vexillata* :**

The female and male parents fertility percentage were 87.84 and 69.54 respectively. Hybrid from direct cross exhibited 51.30 per cent and reciprocal revealed 32.06 per cent pollen fertility.

Vigna radiata* x *Vigna trilobata

The fertility status of the parental species varied from 87.84 per cent in female parent to 65.85 per cent in the male parent. The average pollen fertility of direct cross was 43.50 per cent where as in reciprocal it was 56.78 per cent

***Vigna radiata x Vigna acconitifolia*:**

The direct cross showed 45.00 per cent pollen fertility while reciprocal exhibited 25.20 per cent. The parents *V. acconitifolia* recorded the value of 65.72 per cent

***Vigna radiata* x *Vigna glabresence*:**

The direct cross showed 28.50 per cent pollen fertility while reciprocal exhibited 15.65 per cent. The parents *V. glabresence* recorded the value of 68.32 per cent

Discussion:

In the present investigation with an objective to transfer useful traits from the wild relatives into greengram, interspecific hybridization was attempted. The extent of crossability, morphological features and fertility of hybrids and possibility of obtaining superior recombinants in the F_2 generation through recombination of genomes were studied

In general, the pollen fertility among the direct crosses were higher as compared to their corresponding reciprocal crosses which indicated that the approach using the cultivated species as a female parent is likely to generate better hybrids and segregants . Similar result was reported by various authors for differential pollen fertility among interspecific crosses of *Vigna* species (Pandae *et al.,* 1990, Mendioro and Ramirez, 1994, Ravi *et al.,* 1987, Anandabaskaran and Rangasamy, 1996, Subramanian and Muthiah 2001, Monika *et al.*,2001, Umamaheshwari, 2002 and Sidhu and Satija, 2003). Among the crosses the pollen fertility was highest in the cross *V. radiata* x *V. radiata* var. *sublobata* and this observation support the view of Pandae *et al.*(1990) and Mendioro and Ramirez (1994) that *V. radiata* var. *sublobata* is the probable proginator for *V. radiata*

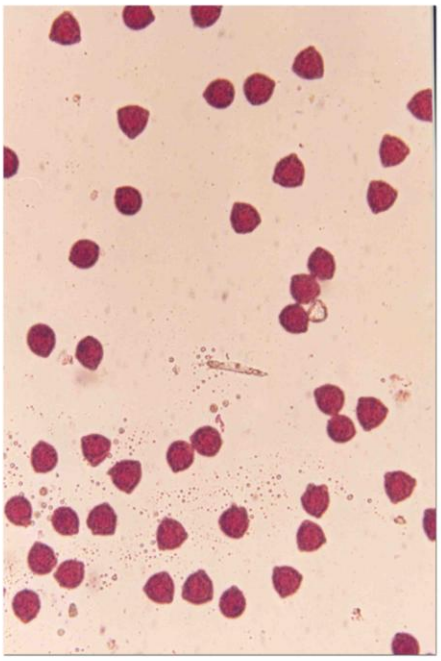
The range of pollen fertility observed in all the F_1 hybrids except the cross *V. radiata* x *V. umbellata* was high enough to obtain sufficient viable F_2 segregants. In the cross *V. radiata* x *V. umbellata* all the pollens were sterile, hence no viable F_2 segregants could be generated. Considering the importance of this cross for the resistance related traits it is essential to device methods for enhancing fertility in F_1 that could aid in developing breeding materials with resistance.

References:

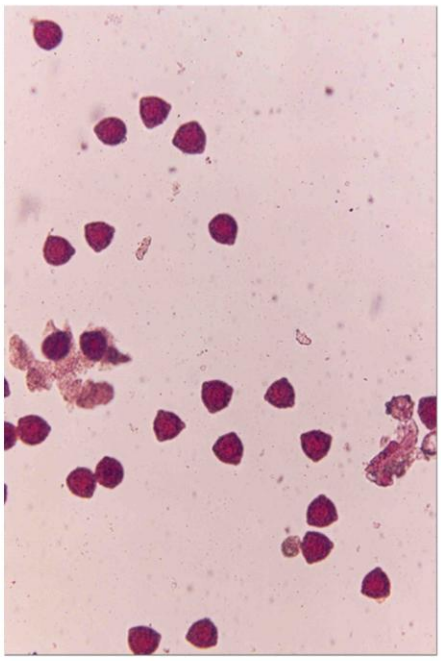
1. Anandabaskaran, A and P. Rangaswamy. 1996. Cytological studies on interspecific hybrids between Vigna radiata and Vigna mungo. Madras Agric. J., 83: 724-726.
2. Mendioro, M.S. and D.A. Ramirez .1994. Post - fertilization barriers in interspecific hybridization (Vigna radiata (l.) Wilczek, V. mungo (L..) Hepper, V. glabrescens, and their reciprocal crosses. Phil. Agric., 3: 359 - 382.
3. Monika, K., P. Singh and P. K. Sareen. 2001. Cytogenetic studies in mungbean- ricebean hybrids. J. Cytol. Genet., 2: 13-16
4. Subramanian, A. and A. R. Muthiah, 2001. Studies on incompatability barriers operating in crosses between V. mungo (L.) Hepper and V. radiata (L.) Wilczek. Legume Res., 24(3): 154 - 158.
5. Pandae, K, S.S. Raghavanshi and P. Prakesh. 1990. Induced high yielding amphiploid of Vigno radiata x Vigna mungo. Cytologia., 55: 249-253.
6. Ravi, J. P. Singh and J. L. Minocha. 1987. Meiotic behaviour of interspecific hybrids of Vigna radiata x Vigna mungo. In: First Symposium on Crop Improvement, Feb.1987, India. pp. 23-27.
7. Uma Maheswari, D. 2002. Wide hybridization in the genus Vigna. M.Sc. (Ag.) Thesis, TNAU, Coimbatore.

Table 1: Pollen fertility percentage of parents and F1 hybrids of interspecific crosses for *Vigna* species

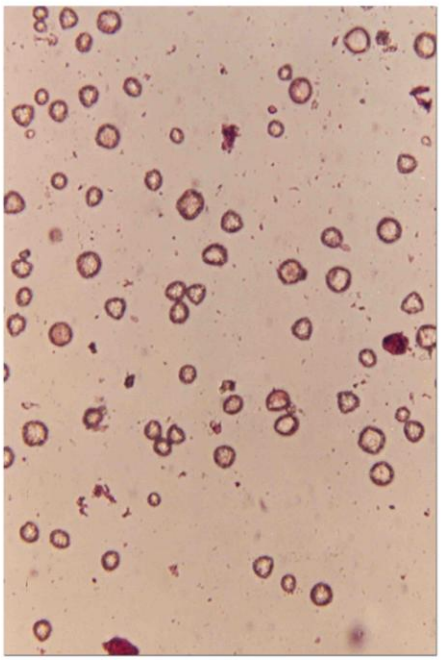
S.No	Parents and Hybrids	Pollen fertility (%)	Crossing Ability
1	*V. radiata*	92.23	-
2	*V. radiata* var. *sublobata*	79.43	-
3	*V. mungo* var .*silvestris*	73.74	-
4	*V. hainiana*	85.84	-
5	*V. umbellata*	86.71	-
6	*V. vexillata*	73.02	-
7	*V. trilobata*	69.14	-
8	*V.acconitifolia*	69.01	-
9	*V.glabresence*	71.74	-
10	V.radiata x V. radiata *var.* sublobata	73.21	22.5
11	*V. radiata* x *V.mungo* var. *silvestris*	63.00	15.3
12	*V. radiata* x *V. hainiana*	62.21	11.2
13	*V. radiata* x *V.umbellata*	54.45	5.3
14	*V. radiata* x *V.vexillata*	53.87	2.8
15	*V. radiata* x *V. trilobata*	45.68	4.8
16	*V. radiata* x *V.acconitifolia*	47.25	4.5
17	*V. radiata* x *V.glabresence*	29.93	5.8
18	*V.radiata* var. *sublobata* x *V.radiata*	52.35	10.2
19	*V. mungo* var. *Silvestris* x *V.radiata*	18.75	6.5
20	*V.hainiana* x *V.radiata*	40.25	3.2
21	*V.umbellata* x *V.radiata*	42.12	2.1
22	*V.vexillata* x *V.radiata*	33.66	2.0
23	*V.trilobata* x *V.radiata*	59.62	3.1
24	*V.acconitifolia* x *V. radiata*	26.46	3.0
25	*V.glabresence* x *V. radiata*	16.43	3.2



V. radiata **fertile pollen**



V. umbellata **fertile pollen**



V. radiata x V. umbellata F_1 hybrid - sterile pollen

Plate 28 Pollen fertility of *V. radiata* and *V. umbellata* and their hybrid