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Research Note

Interspecific hybridization and crossability studies of cultivated varieties of *Vigna mungo* L. Hepper with *Vignamungo* var *silvestris*

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Abstract
Interspecific hybridization was carried out with two cultivars (CO 6 and VBN8) and one wild species *Vigna mungo* var. *silvestris*22/10 in black gram. The crossability and pollen fertility studies were conducted during investigation. Qualitative traits are recorded in the F_1 generation. The hybrid from CO 6 cross had twining tendency, terminal leaflet shape, petiole colour, pod pubescence, and growth pattern similar to *Vignamungo* var. *silvestris*22/10 (male parent). The hybrid from VBN8 cross resembled the male parent for the characters *viz.,* twining tendency and growth pattern. Hence,these qualitative traits can be used to confirm hybridity at the early stage of the crop.

Keywords
black gram, crossability, pollen fertility, and qualitative traits.

Black gram is one of the most highly prized pulses in India. It supplies a dietary nutrition *viz.,* protein, carbohydrates, calcium, and phosphoric acid is popular for its fermenting action. The legume seeds or pulses, sometimes termed as 'grain legumes', are second only to the cereals as a source of human food and provide the much needed proteins to our predominantly vegetarian population. Interspecific hybridization is important for the genetic enhancement of crop plants to transfer desirable characteristics from the related species. For better utilization of variability, it is essential to attempt interspecific crosses and to develop viable hybrids. Realizing the importance of developing resistant varieties along with high yield, the present investigation was undertaken on black gram to understand the crossability through interspecific hybridization programme.

The present investigation was carried in the year 2018 – 2019 at the Department of Pulses, Centre for Plant Breeding and Genetics (CPBG), Tamil Nadu Agricultural University, Coimbatore. Two black gram cultivars (CO 6 and VBN8) and one wild species *Vignamungo* var. *Silvestris* 22/10 were raised during *Kharif* 2018 in crossing block. Interspecific hybridization was carried out by using two black gram varieties (CO 6 and VBN8) as female and one wild accession *Vignamungo*var. *silvestris 22/10* as male. The female and male parents used in interspecific hybridization are given in **Table 1.**

The pollen fertility analysis was studied in the parents and hybrids by Iodine Potassium Iodide (I2 - KI) staining technique. Matured anthers were collected from the parents and the hybrids and squashed on a microscopic slide with one per cent I_2 - KI solution. The slides were observed under a light microscope and the pollen counts were taken for three microscopic fields. Swollen and stained pollen were counted as fertile while, shrunken and unstained pollens were counted as sterile.The crossed seeds were raised during summer 2018-19 along with parents. The qualitative traits observed in the parents and F_1 includes, germination type, hypocotyl colour, twining tendency, terminal leaflet shape, petiole colour, corolla colour, flowering period, pod pubescence and growth pattern.

Table 1.List of genotypes used in interspecific hybridization

Female Parents	Male Parent
CO – 6	*Vignamungo* var. *silvestris*22/10
VBN -8	*Vignamungo* var. *silvestris*22/10

The cultivated varieties of black gram [C06 and VBN8] were crossed with wild species *Vignamungo* var. *Silvestris* 22/10. The crosses were attempted by using black gram cultivars as the female parents as success rate was higher in these crosses as reported by Biswas and Dana (1975) in black gram, Chen *et al.,* (1983) in black gram and green gram, Bharathi *et al.,* (2006) in green gram, and Sehrawat*et al.,* (2016) in black gram. The pod set ranged from 24 to 40 per cent. Among the two crosses, maximum pod set was observed from the cross between VBN-8 and *Vignamungo* var. *Silvestris* 22/10 (40 per cent). The pod set per cent for the cross CO6 x *Vignamungo* var. *Silvestris* 22/10 was only 24 per cent (**Table 2**)**.** Hence, the blac kgram VBN 8 is found to be more compatible to cross with *Vignamungo* var. *Silvestris* 22/10 than CO 6 variety.

Table 2.Cross ability percent in crosses of *Vignamungo* and *Vignamungo*var. *Silvestris*

Sl. No	Characters	Co 6 ×*Vigna mungo*var. *Silvestris* 22/10	VBN 8×*Vigna mungo*var. *silvestris* 22/10
1	Number of flowers crossed	25	20
2	Number of pods set	6	8
3	Pod set percent	24.00	40.00

Nine qualitative characters were recorded in the hybrids and parents (**Table 3**). The hybrid CO-6x*Vignamungo* var. *Silvestris* 22/10 resembled the male parent for the characters *viz.,* twining tendency, terminal leaflet shape, petiole colour, pod pubescence, and growth pattern. The hybrids were found to be intermediate between the parents for the character corolla colour.The hybrid VBN8x*Vignamungo* var. *silvestris*22/10 resembled the male parent for the characters *viz.,* twining tendency, terminal leaflet shape and growth pattern. The hybrids were found to be intermediate between the parents for the character corolla colour exhibiting incomplete dominance. Similar findings are reported by Muhammad *et al* (2005), Pandiyan *et al* (2012) and Jayamani *et al*. (2014).

Table 3. Evaluation of parents and hybrids

Sl. No.	Characters	CO-6	VBN-8	*Vigna mungo var. silvestris 22/10*	CO 6 x Vigna mungo var. silvestris 22/10	VBN - 8 x Vig mungo var. silvestris 22/
1	Germination	Epigeal	Epigeal	Epigeal	Epigeal	Epigeal
2	Hypocotyl colour	Purple	Green	Dark purple	Purple	Dark purple
3	Twining tendency	Absent	Absent	Intermediate	Intermediate	Intermediate
4	Terminal leaflet shape	Ovate	Lanceolate	Ovate-lanceolate	Ovate –lanceolate	Ovate-lanceo
5	Petiole colour	Greenish purple spots	Green	Greenish purple	Greenish purple	Greenish pur
6	Corolla colour	Yellow	Purple yellow	Yellow	Yellowish green	Yellowish gre
7	Flowering period	Synchronous	Synchronous	Asynchronous	Synchronous	Synchronous
8	Pod pubescence	Glabrous	Dense	Dense	Dense	Dense
9	Growth pattern	Determinate	Determinate	Indeterminate	Indeterminate	Indeterminate

The pollen fertility of the parents ranged from 92.88 to 94.25 per cent. Bhanu *et al*. (2017) recorded a pollen fertility of 1.6 to 3.4 per cent for the hybrids obtained from the green gram x rice bean cross. The fertility status of the parents and hybrids are presented in **Table 4** and **Fig.2**. Three parents exhibited maximum pollen fertility. The pollen fertility studies in F_1 hybrids revealed that the both crosses showed high pollen fertility status. The hybrid from the CO 6x*Vignamungo*var. *silvestris* 22/10 recorded 89.77 per cent pollen fertility and VBN 8x*Vignamungo*var. *silvestris* 22/10 recorded 87.33 per cent pollen fertility. Both the crosses exhibited complete pod set.

CO 6 x *Vignamungo*var. *silvestris 22/10*

VBN 8 x *Vignamungo*var. *silvestris 22/10*

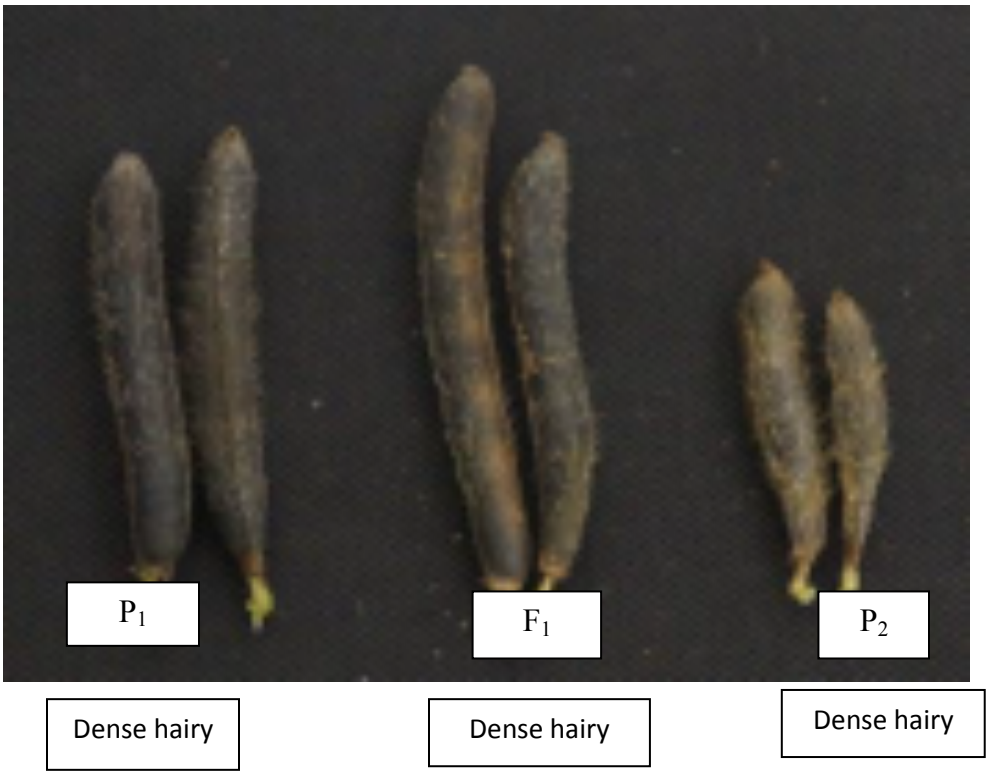


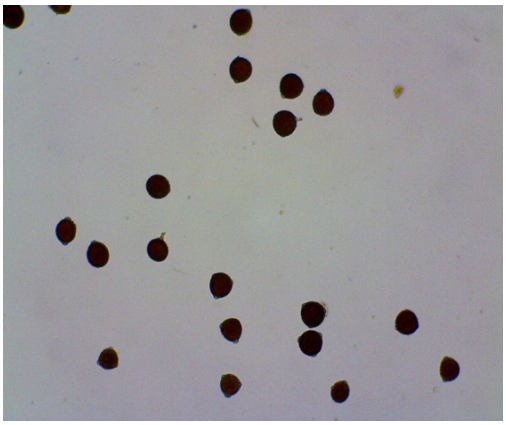
Fig.1. Pod pubescence in parents and hybrids

Table 4. Pollen fertility of parents and hybrids

Sl. No.	Parents/Hybrids	Pollen Fertility (per cent)
1	Co 6	94.25
2	VBN – 8	92.88
3	*Vignamungo* var. *silvestris*22/10	93.03
4	CO 6 x *Vignamungo* var. *silvestris*22/10	89.77
5	VBN 8 x *Vignamungo* var. *silvestris*22/10	87.33

The cross ability and pollen fertility studies of interspecific hybridization studies, using two black gram varieties (CO 6 and VBN8) as female and one wild accession *Vignamungo*var. *Silvestris* 22/10 as male revealed that the pod set ranged from 24 to 40 per cent. The pod set per cent recorded a maximum of 40 per cent for the cross VBN8 × *Vignamungo*var. *Silvestris* 22/10. The pollen fertility studies showed that the hybrids viz., CO 6 x *Vignamungo*var. *Silvestris* 22/10 and VBN 8 x *Vignamungo*var. *Silvestris* 22/10 recorded 89.77 per cent and 87.33 per cent for pollen fertility respectively. It clearly indicated that the high pollen fertility for both the hybrids Interspecific hybridization resulted in the development of fertile hybrids. Both the hybrids resembled the male parent for the characters *viz.,* twining tendency and growth pattern. Hence, these qualitative traits can be used to confirm hybridity at the early stage of the crop. The outcome will be useful to improve the yield, pest and disease resistance in black gram.

CO 6 x *Vignamungo*var. *silvestris 22/10*



VBN 8 x *Vignamungo*var. *silvestris 22/10*

Fig.2. Pollen Fertility Studies in Hybrids

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