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Hemkumar
Department of Genetics and Plant Breeding, IGKV, Raipur, Chhattisgarh, India

PK Joshi
Department of Genetics and Plant Breeding, IGKV, Raipur, Chhattisgarh, India

Alice Tirkey
Department of Genetics and Plant Breeding, IGKV, Raipur, Chhattisgarh, India

Kamini
Department of Genetics and Plant Breeding, IGKV, Raipur, Chhattisgarh, India

Corresponding Author:
Hemkumar
Department of Genetics and Plant Breeding, IGKV, Raipur, Chhattisgarh, India

Study of the association of seed yield with other quantitative traits along with direct and indirect effect in velvet bean (*Mucuna pruriens* L)

Hemkumar, PK Joshi, Alice Tirkey and Kamini

Abstract
Velvet bean belongs to the Fabaceae family, commonly known as kewanch in Hindi. Velvet bean used against Parkinsons disease, fertility disorders, leprosy, treating pain, cholera, cough, diabetes, kidney stone, constipation, strangury, dysmenorrhea, amenorrhea, and ulcers and also used as food and forage. It is being cultivated all over India but not in a commercial way. The materials of the experiment comprised of twenty-eight (28) genotypes of velvet bean (collected from various region of Chhattisgarh) in addition to three (3) check variety *viz* Arka Ashwini, Arka Daksha, Arka Dhanwantri. Analysis of variance revealed significant for all the studied characters. The higher seed yield per plant was recorded for MP-11 (228.9 g) than the check variety Arka Ashwini (216.3 g). Similarly, highest seed index recorded in MP-13 (176.2 g) and highest protein percent recorded in MP-3 (36.1%). The favourable genotypes of velvet bean can be utilized for crop improvement programs in the state. Path coefficient analysis revealed that seed width exhibited a most extreme positive effect on seed yield per plant followed by weight of dry pod, days to 50 percent flowering, number of flowers per bunch, inter-node length, pod width, number of pods per bunch and seed index.

Keywords: Velvet bean, path analysis, direct and indirect effect

Introduction
Mucuna pruriens commonly known as velvet bean, devil bean, cowhage, kewanch, cowitch and atmagupta (Anonymous, 1985) [2]. *Mucuna pruriens* (L.) is an important underutilized tribal pulse with diploid chromosome number (2n=22) which belonging to the family Fabaceae and sub-family Papilionaceae. Mucuna has annual and perennial approx 150 species. Genus Mucuna is underutilized wild legume crop. Velvet bean (*Mucuna pruriens*) found in the tropical and subtropical area of the world. Its good source of dietary proteins, it has high protein concentration around 25% to 35%. Digestibility of velvet bean protein is high as compared to rice, soybean, lima bean (Lampariello 2012) [10]. Velvet bean is a self-pollinated crop (Capo-Chichi *et al*., 2001) [3]. It is a climber-type crop. They have a yellow and violet colour flower. Pods are two colour green (no pubescence) and browny orange (present pubescence). Browny orange pod have Mucunain which cause itching. Velvet bean is an annual climber crop. The leaves have pubescence, three foliate leaves present, white or violet flower length is ranging from 2.5 to 3.7 cm long, it has s shape curved pod, green or brown-orange colour pod found, pod length ranging from 10 to 20 cm long covered with pubescence, seed length ranging from 5 to 6 mm, seed colour is white or black in colour and number of seeds present in per pod is four to six. Its seeds are widely used in Ayurvedic system of medicine to the treatment of male fertility, nervous disorders and as an aphrodisiac. Mucuna seed is a constituent of more than 200 indigenous drug formulations. Velvet bean contains toxic compounds like L-dopa and hallucinogenic tryptamines and anti-nutritional factors such as phenols and tannins. The seeds are rich source of L-Dopa; L-Dopa is a non-protein amino acid extracted from the seed of Mucuna and used in the treatment of Parkinson's disease (Lampariello *et al*., 2012) [10]. L-Dopa extracted from seeds of Mucuna is more effective than the synthetic drug to the treatment of Parkinson's disease. Unprocessed velvet bean contains a toxic chemical that's why exhibited tolerance level to insect pest (Duke, 1981) [7]. Mucuna is a hardy crop it can tolerate adverse environmental conditions such as drought, low soil fertility and high soil acidity. Mucuna is effective in lowering the nematode population (Queneherve *et al*. 1998) [11]. Velvet bean has a nematicidal allelopathic activity which is important for crop improvement. (Gliessman *et al*., 1981) [9].

Velvet bean used for reclamation of degraded land, India 187 mha waste land present which is approx 56.83% of total geographical area. Direct and indirect effects by path analysis helps in making selection more effective. The magnitude of genetic parameters like analysis of Path coefficient and correlation analysis are important since it imparts valuable information about the association between two traits and also explains the partitioning of the effects into direct or indirect effects (Diz *et al.*, 1994) [6].

Materials and Methods

The present investigation "Study the association of yield with other quantitative traits along with direct and indirect on seed yield in *(Mucuna pruriens* L.)" was carried out during Kharif 2019-20 at the Herbal Instructional Garden of Research Cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, Chhattisgarh. The material under study constituted 28 genotypes of velvet bean including cultivated and wild species which are collected from various regions of Chhattisgarh with three check variety *viz*. Arka Dhanwantari, Arka Ashwini, Arka Daksha. All the 28 genotypes with three check varieties were planted in Randomized Block Design (RBD) with three replication during the *Kharif* 2019. Each entry was planted in 2 rows of 4-meter length having plant to plant spacing within rows at 1 meter distance, 1.5 meter between rows, and 2 meter between replication. Doses of N:P:K was 20:60:60 Kg per hectare was provided to acquire the normal growth of the crop. The experimental material was subjected to three different types of observation *viz*, quantitative, qualitative, and biochemical traits. Observation on 14 quantitative, 6 qualitative, 2 biochemical (including post-harvest parameter) traits were recorded. The quantitative traits such as days to 50% flowering, inflorescence length, number of flowers per bunch, days to maturity, internode length, number of effective pods per bunch, pod length, pod width, weight of dry pod, number of seed per pod, seed length, seed width, 100 seed weight, seed yield per plant. The qualitative traits such as flower colour, seed colour, leaf colour, colour of pod, pubescence in the pod and root nodules. Wright suggested a way to calculate path coefficient analysis which was further elaborated by Dewey and Lu (1959) [5]. Path coefficient analysis is a way to distribute correlation analysis into further path which shows the effect of those independent variables in dependent variable along with its major effect of contribution which is named as direct and indirect variables.

Result and Discussion

In this investigation, ANOVA indicated that the mean sum of square due to genotype was significant for all the traits studied (Table 1) and the mean performance of thirty-one genotypes are presented in (Table 2).

Path coefficient analysis was carried out to partition the correlation coefficients into the components of direct and indirect effects. Two characters may show correlation just because they are correlated with a common third one. With the inclusion of more variables in the correlation study; their indirect association becomes more complex. In such circumstances, path coefficient analysis provides 41 an effective means of a critical examination of specific forces action to produce a given correlation and measure the relative importance of each factor. In this analysis, the seed yield plant was taken as the dependent variable and the rest of the characters were considered as dependable variables. The genotypic path coefficients of seed yield per plant contributing characters in velvet bean. In genotypic path coefficient analysis, seed width (cm) showed high positive direct effect on seed yield per plant, followed by weight of dry pod, days to 50% flowering, a number of flower per bunch, inter-node length, pod width, number of pod per bunch 100 seed weight. Pod length (cm) showed a negatively higher direct effect on seed yield per plant by followed by seed length Inflorescence length, days to maturity and number of seed per pod. The estimates of residual effect (2.2438) obtained in genotypic path coefficient analysis were high, indicating that some more characters should be included in the study.

Chinapolaiah *et al.*, (2019) [4] experimented ICAR-Directorate of Medicinal and Aromatic, Plants Research, Anand, Gujarat, India in velvet bean *(Mucuna pruriens* L.). revealed that days to 50% flowering, number of flower per bunch, pod length, number of pod per bunch, days to maturity and 100 seed weight direct effect on seed yield per plant which is similar to our finding trait.

Fatema (2015) [8] conducted experiment at the Department of Genetics and Plant Breeding, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh, they revealed that the number of seeds per pod has a direct effect on seed yield per plant in french bean *(Phaseolus vulgaris)*, which is not similar to our finding traits.

Ahmed, S. (2011) [1], conducted experiment at Regional Research Station and Faculty of Agriculture Wadura (J & K) in French bean *(Phaseolus vulgaris).* Observed that path coefficient analysis showed positive direct effect for seed yield per plant by days to 50% flowering, number of pods per plant, pod length, 100 seed weight. which is similar to our finding traits.

Shinde *et al.*, (2001) [12] conducted experiment at Mahatma Phule Krishi Vidyapeeth, Rahuri (India) in french bean *(Phaseolus vulgaris).* Reported the character's 100 seed weight and a number of seeds per pod showed a positive direct effect. The direct negative effect on yield was observed for pod length and days to the first flower. the direct effect of 100 seed weight and pod length and days to maturity is similar to one finding whereas result are in contrast for number of seed per pod and negatively direct effect on seed yield per plant.

Table 1: Details of the genotypes used understudy

S.no.	Genotypes	Location	S.no.	Genotypes	Location
1	MP 1	Bilaspurilaspur	17	MP 18	Balrampur
2	MP 2	Bilaspur	18	MP 19	Raipur
3	MP 3	Bilaspur	19	MP 20	Raipur
4	MP 4	Bilaspur	20	MP 23	Ambikapur
5	MP 5	Bilaspur	21	MP 24	Baloda Bazar
6	MP 6	Bilaspur	22	MP 26	Baloda Bazar
7	MP 7	Bilaspur	23	MP 29	Raipur r
8	MP 8	Bilaspur	24	MP 30	Baloda Bazar
9	MP 9	Dhamtari	25	MP 31	Baloda Bazar
10	MP 10	Dhamtari	26	MP 32	Raipur
11	MP 11	Dhamtari	27	MP 33	Rajnandgaon
12	MP 12	Dhamtarimtari	28	MP 34	Bilaspur
13	MP 13	Dhamtari	29	Arka Dhanwantari (check-1)	IIHR Bangalore
14	MP 14	Balrampur	30	Arka Ashwini (check-2)	IIHR Bangalore
15	MP 15	Balrampur	31	Arka Daksha (check-3)	IIHR Bangalore
16	MP 17	Balrampur			

Table 2: ANOVA for seed yield and its components in velvet bean (during 2019-20 at IGKV Raipur C.G.)

S.N.	Source of variance	Degree of freedom	Days to 50% flowering	No. of flowers per bunch	Inflorescence length (cm)		Inter-node length (cm)	No. of pods per bunch	Pod length (cm)	Pod width (cm)
1	Replication	2	133.4	2.1	3.6		10.8	0.3	0.7	0.01
2	Genotype	30	1791.21**	36.68**	37.42**		16.21**	2.33**	11.79**	0.11**
3	Error	60	144.31	1.76	2.39	3.63	0.42	0.70		0.04

S.N.	Source of variance	Degree of freedom	No. of seeds per pod	Seed length (cm)	Seed width (cm)	100 seed weight (g)	Days to maturity	Weight of dry pod (g)	Seed yield per plant (g)
1	Replication	2	0.23	0.03	0.01	97.19	61.00	4.01	31.24
2	Genotype	30	0.32**	0.26**	0.12**	2647.14**	351.00**	16.11**	8752.16**
3	Error	60	0.10	0.02	0.01	70.72	100.20	1.68	585.06

** significant at 1% level, * significant at 5% level

Table 3: Mean performance of genotype for seed yield per plant and its component in Velvet bean

S. No.	Genotypes	Days to 50% flowering	No. of flowers per bunch	Inflorescence length (cm)	Inter-node length (cm)	No. of pods per bunch	Pod length (cm)	Pod width (cm)	No. of seeds per pod	Seed length (cm)	Seed width (cm)	100 seed weight (g)	Days to maturity	Weight of dry pod (g)	Seed yield per plant
1.	MP 1	82.0	5.0	7.2	23.9	5.3	12.0	1.9	5.3	2.3	1.6	148.4	202.0	11.6	95.2
2.	MP 2	91.0	15.3	14.0	23.6	5.7	11.4	2.0	5.7	2.0	1.5	108.0	206.7	10.9	152.9
3.	MP 3	104.0	13.3	18.1	20.5	6.0	11.1	2.0	5.7	2.0	1.6	110.3	206.0	13.9	76.2
4.	MP 4	110.7	8.3	7.5	19.4	6.0	10.6	1.8	5.7	2.0	1.4	115.8	229.3	10.4	181.9
5.	MP 5	145.0	6.0	10.4	14.8	5.0	8.5	1.9	5.0	1.8	1.4	103.8	251.0	8.4	81.9
6.	MP 6	142.3	9.0	9.7	18.6	5.3	8.7	1.6	5.0	1.6	1.3	104.1	234.3	10.5	113.8
7.	MP 7	127.3	13.7	12.7	17.7	4.7	9.7	1.8	5.0	1.7	1.3	101.5	230.0	9.2	106.6
8.	MP 8	107.0	5.7	9.5	19.0	4.7	10.2	1.7	5.3	1.8	1.3	117.0	227.7	11.7	147.2
9.	MP 9	96.0	12.7	7.6	18.9	4.7	10.6	1.9	5.0	1.9	1.3	128.2	225.3	12.0	83.9
10.	MP 10	109.7	10.0	11.9	21.9	5.7	11.7	1.9	6.0	1.9	1.5	116.0	220.0	14.0	73.8
11.	MP 11	131.3	12.0	10.5	17.5	5.0	9.8	1.8	5.0	1.7	1.3	119.0	230.0	10.7	228.9
11.	MP 12	82.0	7.7	4.9	18.5	3.7	12.1	2.0	5.3	2.2	1.5	157.7	225.0	13.8	53.2
12.	MP 13	82.0	5.3	6.1	19.4	4.3	11.1	2.1	5.0	2.3	1.6	176.2	209.7	14.8	88.5
13	MP 14	157.0	8.7	16.5	21.1	4.7	8.8	1.6	5.0	1.7	1.3	129.4	230.3	10.3	116.9
14.	MP 15	113.3	13.7	11.6	18.6	4.7	12.3	2.1	6.0	2.0	1.5	137.2	220.7	13.9	114.6
15.	MP 17	106.7	6.0	6.5	18.4	4.3	10.5	1.9	5.0	1.9	1.4	111.5	227.7	8.6	175.3
16.	MP 18	171.0	14.0	13.8	15.8	5.0	8.7	1.3	5.0	1.6	1.3	103.7	246.7	11.5	121.5
17.	MP 19	160.7	12.7	10.1	15.7	5.0	7.8	1.4	5.3	1.5	1.1	81.9	240.3	7.9	115.9
18.	MP 20	123.7	16.0	16.2	18.4	4.7	10.5	1.8	5.3	1.7	1.3	119.4	231.7	13.7	70.5
19.	MP 23	119.0	7.7	12.9	15.9	4.3	9.8	1.8	5.0	1.7	1.2	108.8	234.0	9.9	205.3
20.	MP 24	123.3	11.3	13.6	15.7	3.0	5.0	1.7	5.0	1.0	0.8	38.2	234.0	6.3	25.3
21.	MP 26	102.3	6.3	14.3	18.2	4.0	5.3	1.6	5.0	1.1	0.9	47.1	234.0	6.4	42.2
22.	MP 29	97.0	5.0	7.1	17.2	2.7	10.1	1.8	5.0	2.0	1.4	112.0	226.7	11.9	163.0
23.	MP 30	130.0	5.7	7.3	16.4	4.3	5.5	1.8	5.0	1.6	0.8	52.6	234.0	6.0	29.0
24.	MP 31	150.0	8.3	7.9	19.3	4.3	9.3	1.7	5.0	1.6	1.3	104.3	234.0	10.2	146.2
25.	MP 32	101.3	7.0	13.2	15.4	5.3	9.1	1.7	5.0	1.8	1.3	97.1	232.7	10.7	82.5
26.	MP 33	110.3	5.3	8.5	17.6	4.3	11.0	2.0	5.0	1.9	1.5	117.3	225.7	12.3	103.9

27.	MP 34	91.7	13.3	13.2	21.8	5.0	10.5	1.7	5.0	1.9	1.4	120.1	219.7	11.0	52.4
28.	Arka Dhanwantari	135.3	9.7	15.3	18.1	5.3	9.0	2.0	5.0	1.9	1.4	93.2	220.3	9.2	47.3
29.	Arka Ashwini	82.7	5.3	5.8	21.8	5.0	13.2	2.0	5.7	2.0	1.5	161.3	225.0	12.3	216.3
30.	Arka Daksha	106.7	11.3	10.5	18.9	7.3	11.9	2.0	5.7	2.0	1.6	113.5	225.7	11.9	95.2

Table 4: Path coefficient analysis of seed yield per plant and its component

Character	Days to 50% flowering	No. of flowers per bunch	Inflorescence length (cm)	Inter-node length (cm)	No. of pod per bunch	Pod length (cm)	Pod width (cm)	No. of seed per pod	Seed length (cm)	Seed width (cm)	100 seed weight (g)	Days to maturity	Weight of dry pod (g)
Days to % flowering	6.47	1.51	-5.47	-2.70	0.05	9.94	-2.19	2.32	10.20	-6.91	-0.23	-9.60	-3.38
No. of flower per bunch	1.89	5.15	-8.91	0.34	0.51	-1.12	-0.62	-2.01	3.20	0.02	-0.06	0.24	1.23
Inflorescence length (cm)	2.48	3.22	-14.24	-0.05	0.31	5.61	-0.88	-0.10	7.31	-2.93	-0.20	0.12	-0.97
Internode length (cm)	-3.95	0.40	0.17	4.42	0.62	-12.36	1.31	-4.76	-10.37	9.58	0.28	10.77	4.03
No. of pod per bunch	0.23	1.94	-3.30	2.03	1.36	-7.32	0.57	-3.89	-6.64	8.79	0.09	4.37	1.87
Pod length (cm)	-3.62	0.33	4.50	3.07	0.56	-17.77	1.82	-4.43	-16.01	16.27	0.44	8.62	6.63
Pod width (cm)	-5.41	-1.22	4.80	2.20	0.30	-12.36	2.62	-4.11	-13.32	11.84	0.28	10.68	3.74
No. of seed per pod	-2.41	1.66	-0.24	3.39	0.85	-12.67	1.73	-6.21	-8.94	10.09	0.19	7.57	5.12
Seed length (cm)	-3.81	-0.95	6.01	2.65	0.52	-16.44	2.01	-3.21	-17.31	15.20	0.45	9.04	6.05
Seed width (cm)	-2.65	0.01	2.47	2.51	0.71	-17.13	1.83	-3.71	-15.58	16.89	0.43	8.09	6.42
100 seed weight (g)	-2.96	-0.59	5.82	2.53	0.26	-15.92	1.46	-2.35	-15.73	14.48	0.50	6.50	6.39
Days to maturity	5.29	-0.11	0.15	-4.05	-0.50	13.04	-2.38	4.00	13.33	-11.63	-0.27	-11.74	-5.10
Weight of dry pod (g)	-2.93	0.85	1.85	2.39	0.34	-15.80	1.31	-4.27	-14.03	14.54	0.42	8.02	7.46

Conclusion

Maximum and minimum seed yield per plant observed in MP-11 (228.9 g) and MP-24 (25.33 g) respectively. In path analysis, the characters seed width in centimeter, weight of dry pod in gram, no. of flower per bunch, days to 50 percent flowering i.e the days required for blooming in 50 percent plants, inter-node length in centimeter, no. of pod per bunch, pod width in centimeter, seed index in gram had direct effect in positive direction towards seed yield per plant. The residual effect is 2.24 means indicates that there are other characters which are not included in the study having direct effect on seed yield.

References

1. Ahmed S. Variability, correlation and path analysis for seed yield and yield-related traits in common beans. Indian Journal of Horticulture. 2011;68(1):61-65.
2. Anonymous. The wealth of India. Raw materials. CSIR New Delhi. 1985;6:442.
3. Capo-Chichi LJA, Weaver DB, Morton CM. AFLP assessment of genetic variability among velvet bean (*Mucuna* sp.) accessions. Theoretical and Applied Genetics. 2001;103(8):1180-1188.
4. Chinapolaiah A, Bindu KH, Manjesh GN, Thondaiman V, Shivakumara KT. Genetic variability, correlation and path analysis for yield and biochemical traits in velvet bean (*Mucuna pruriens* (L.)). Journal of Pharmacognosy and Phytochemistry. 2019;8(4):2698-2704.
5. Dewey DH, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. Agronomy Journal. 1959;51:515-518.
6. Diz DA, Wofford DS, Schank SC. Correlation and path-coefficient analyses of seed-yield components in pearl millet x elephant grass hybrids. Theoretical and Applied Genetics. 1994;89(1):112-115.
7. Duke JA. Handbook of legumes of world economic importance. New York, NY, USA: Plenum press; c1981.
8. Fatema R. Phenotypic evaluation of genotypes based on agro-morphological and nutritional traits of kidney bean (*Phaseolus vulgaris* L.). (Doctoral dissertation, department of genetics and plant breeding, Sher-e-Bangla agricultural university, Sher-e-Bangla Nagar, Dhaka-1207); c2015.
9. Gliessman SR, Garcia RE, Amador MA. The ecological basis for the application of traditional agricultural technology in the management of tropical agroecosystems. Agro-ecosystems. 1981;7(3):173-185.
10. Lampariello LR, Cortelazzo A, Guerranti R, Sticozzi C, Valacchi G. The magic velvet bean of Mucunapruriens. Journal of Traditional and Complementary Medicine. 2012;2(4):331-339.
11. Queneherve P, Topart P, Martiny B. Mucunapruriens and other rotational crops for control of Meloidogyne incognita and *Rotylenchulus reniformis* in vegetables in polytunnels in Martinique. Nematropica. 1998;28:19-30.
12. Shinde SS, Dumbre AD. Correlation and path coefficient analysis in French bean. Journal of Maharashtra Agricultural Universities (India); c2001.