Journal of Science and Research Innovations

Volume - 3, Issue - 2, Dec. 2025, ISSN: 2583-9004 (ONLINE)

Correlation between growth traits and 100-Seed weight of *Rauvolfia Serpentina*

Gufran Usmani [1]* and Yogeshwar Mishra [2]

[1,2]Tropical Forest Research Institute
P.O.-R.F.R.C., Mandla Road, Jabalpur, (M.P.), 482021, India

Email: drgufran@hotmail.com

ABSTRACT:

An investigation was carried out with 15 populations of *Rauvolfia serpentina* to assess variability, association of floral leaf and seed traits. There was appreciable range of variability for all of floral leaf and seed traits viz. days to initiation of flowering, days to 50% flowering, number of flowers per inflorescence, number of fruits per inflorescence, number of inflorescence per plant, leaf length, leaf width and 100-seed weight at phenotypic level. Analysis of variance revealed that all the traits were variable significantly, indicating scope for selection for improvement in *Rauvolfia serpentina.* Days to initiation of flowering showed significant positive correlation with days to 50% flowering and 100-seed weight whereas it showed negative association with number of inflorescence per plant, leaf length. Days to 50% flowering showed significant negative correlation with number of inflorescence per plant. Number of fruits per inflorescence showed significant positive correlation with leaf length and negative with 100-seed weight. Number of inflorescence per plant showed significant negative correlation with leaf length. Leaf length showed significant positive correlation with leaf width and negative with 100-seed weight.

KEY WORDS: *Rauvolfia serpentina*, variability, floral leaf and seed character association.

Received: 14-11-2025 **Revised: 15-11-2025** **Accepted: 17-03-2025**

INTRODUCTION:

Rauvolfia serpentina (L.) Benth. ex. Kurz. (2n=22), is an important medicinal plant recognized worldwide. Several species of *Rauvolfia* are observed growing under varying edapho-climatic conditions in the humid tropics of South and South East Asian countries. In India, it is found growing in many states including Assam, Andhra Pradesh, Bihar, Goa, Karnataka, Kerala, Orissa, West Bengal and Uttar

Pradesh. The plant is encountered more commonly on the forest margin of mixed deciduous forests. It also occurs in the foot-hills of Himalayan range. It is a rich source of indole alkaloids of medicinal value such as reserpine, ajmaline, ajmalicine and serpentine. The plant is useful in treatment of circulatory disorders (Tyler *et al*., 1981) and also helps to reduce blood pressure by dilating blood-vessels, depresses activity of central nervous system and acts as a hypnotic. Because of these alkaloids, especially reserpine in the root of *R. serpentina* it has attracted worldwide attention for drug development. Presently all supplies of roots are being met from the natural resource and its indiscriminate, intensive uprooting and overexploitation by tribal and local collectors brought the plant to the verge of extinction (Rajendra and D'souza, 1999). This has led to listing of this species as "endangered" by the International Union for Conservation of Nature and Natural Resources (IUCN) (Jain *et al.*, 2003). In India, it has also become an endangered due to overexploitation and Government of India has prohibited the collection of plants growing in wild in forests and its export.

MATERIAL AND METHODS:

Collection of germplasm

The germplasm of 15 populations of *R. serpentina* were collected from forest areas of different states of India. All populations were collected in the form of bulk drupe fruits, seeds or seedlings. Collection of material was done between August to October of 2006. The collected seeds were depulped, cleaned and air dried. Subsequently they were stored in plastic bags. Only heavy seeds from all the accessions that did not float on the water in pot were scarified with ordinary sand paper and pretreated with Gibberrelic acid (GA) (300 ppm) and sown in separate mother beds in last week of October 2006 for seed increase.

Raising nursery and establishment of field trials

A nursery of 15 populations was established and seedlings were developed in polythene bags during 15 April to 15 July 2008 at the nursery of the institute. After 12 weeks in nursery, seedlings were transferred to the experimental site at TFRI, Jabalpur in August 2008. Standard agronomical dimensions and practices were used on this site. A total of 405 seedlings were planted in a randomized complete block design (RCBD) with three replications under control irrigated conditions. Each replication consisted three rows plots of nine individuals per population where row to row (RTR) and plant to plant (PTP) spacing

were 0.5m. The plot size was 2 m x 2 m keeping a row to row distance of 0.5m and plant to plant distances of 0.5 m. Whole experimental area was surrounded by a border row.

Location, climate and weather:

The field experiment was raised at the institute farm ($23^0$10'N latitude and $79^0$59'E longitude). The area receives an annual rainfall of 1,100 mm with annual temperature of 20–22 ^{0}C (minimum 5.9 ^{0}C, maximum 42.8 ^{0}C). The maximum relative humidity during hot months (April–June) ranged from 35 to 80 % and minimum was 13–59 %. The maximum daily sunshine of 10.2 h was in May and minimum of 1.9 h in August. The soil is clay loam with semi-humid sub-tropical climate.

Assessment of floral, leaf and seed characteristics:

In order to analyze inter population variation based on floral, leaf and seed characters between the selected 15 populations, data on eight characters viz. days to initiation of flowering, days to 50% flowering, number of flowers per inflorescence, number of fruits per inflorescence, number of inflorescence per plant, leaf length, leaf width and 100-seed weigh were recorded on five individuals selected at random each from three replications and mean values estimated.

Statistical analysis

The data obtained was subjected to following statistical analyses using Windostat Software version 8.5 (Indostat Services, Hyderabad).

Analysis of variance

The data were subjected to analysis of variance as per the design using standard statistical procedure (Panse and Sukhatme, 1967) and the replication and treatment mean sum of squares (MSS) were tested against error mean sum of square by F-test.

Various parameters of variability viz., mean, range, phenotypic coefficient of variation (PCV) were worked out. Phenotypic coefficient of variation were computed for each trait using the formula given by Burton (1952) and expressed in terms of percentage.

Journal of Science and Research Innovations

Volume - 3, Issue - 2, Dec. 2025, ISSN: 2583-9004 (ONLINE)

Results

The data generated during experimentation were subjected to statistical analysis and the results obtained are presented below:

Analysis of variance

The analysis of variance was carried out for eight floral, leaf and seed characteristics viz. days to initiation of flowering, days to 50% flowering, number of flowers per inflorescence, number of fruits per inflorescence, number of inflorescence per plant, leaf length, leaf width and 100-seed weight and presented in table 1. The analysis of variance revealed that the mean sum of square due to populations were significant for all the characters at 5% and 1 % level of probability except days to 50% of flowering in *Rauvolfia serpentina.*

Table 1. Analysis of variance for 8 floral, leaf and seed characteristics in *R. serpentina*

Source	df	DF	DFF	NFPI	NFrPI	NIPP	LL	LW	100SW
		Mean Squares							
Rep.	2	71.36	0.00	45365.77	71.27	31.44	5.92	0.85	0.002
Pop.	14	844.95**	1223.46	109040.52**	201.68**	14.66**	4.64**	0.50*	0.279**
Error	28	27.02	1025.00	30889.24	41.42	4.13	1.22	0.24	0.004
Total	44								
CD (0.05)		8.69	53.54	293.89	10.76	3.40	1.85	0.82	0.11

Note: *, ** denote statistical significance at the 5 and 1 percent level of probability, respectively

DF -days to initiation of flowering, DFF -days to 50% flowering, NFPI -number of flowers per inflorescence, NFrP -number of fruits per inflorescence, NPP -number of inflorescence per plant, LL -leaf length, LW -leaf width and 100SW -100-seed weight

1.1. Phenotypic coefficients of variation

Phenotypic coefficients of variation estimates were highest for number of fruits per inflorescence of 166.80 percent, followed by number of inflorescence per plant (74.05), number of flowers per inflorescence (42.75), leaf width (11.85), days to 50% flowering (11.64), leaf length (11.60), 100-seed weight (6.69) and days to initiation of flowering (6.28) (Table 2).

Journal of Science and Research Innovations

Volume - 3, Issue - 2, Dec. 2025, ISSN: 2583-9004 (ONLINE)

Table 2. Descriptive statistics and estimates of genetic parameters of floral, leaf and seed characteristics in *R. serpentina*

		DF	DFF	NFPI	NFrPI	NIPP	LL	LW	100SW
General Mean		275.62	283.77	558.11	5.84	3.73	13.24	4.81	4.63
Range	Mini.	305.00	319.80	999.43	33.40	7.25	14.47	5.42	5.36
	Maxi.	249.33	258.20	322.62	0.50	0.63	10.25	4.08	4.06
PCV (%)		6.28	11.64	42.75	166.80	74.05	11.60	11.85	6.69

DF -days to initiation of flowering, DFF -days to 50% flowering, NFPI -number of flowers per inflorescence, NFrP -number of fruits per inflorescence, NPP -number of inflorescence per plant, LL -leaf length, LW -leaf width and 100SW -100-seed weight, PCV phenotypic coefficient of variance

1.2. Association of characters

1.2.1. Analysis of correlation coefficients

Correlation coefficients were estimated to study the relationships among the traits. The correlation coefficients (r) among floral and vegetative phenological characteristics viz. days to initiation of flowering, days to 50% flowering, number of flowers per inflorescence, number of fruits per inflorescence, number of inflorescence per plant, leaf length, leaf width and 100-seed weight are presented in table 3. Days to initiation of flowering recorded significant positive correlation (0.49) with days to 50% flowering, followed by 100-seed weight (0.44), and negative with number of inflorescence per plant (-0.33), leaf length (-0.26) at phenotypic levels. Days to 50% flowering recorded significant negative correlation with number of inflorescence per plant (-0.45). Number of fruits per inflorescence showed significant positive correlation (0.30) with leaf length and negative with 100 seed weight (-0.32). Number of inflorescence per plant exhibited significant negative correlation (-0.30) with leaf length. Leaf length showed.

Table 3. Estimation of phenotypic correlation coefficient among floral, leaf and seed characteristics in *R. serpentina*

		DF	DFF	NFPI	NFrPI	NIPP	LL	LW	100SW
DF	P	1.00	**0.49****	-0.12	-0.23	-0.33*	-0.26*	-0.06	**0.44***
DFF	P		1.00	0.04	-0.13	**-0.45***	-0.04	0.04	0.20
NFLPI	P			1.00	0.00	0.18	-0.06	0.00	0.22

NFRPI	P	1.00	0.13	0.30*	0.14	-0.32*
NIPP	P		1.00	-0.30*	-0.03	0.15
LL	P			1.00	**0.60****	**-0.45***
LW	P				1.00	-0.08
100SW	P					1.00

Note: *, ** denote statistical significance at 5 and 1 percent level of probability, respectively

DF -days to initiation of flowering, DFF -days to 50% flowering, NFPI -number of flowers per inflorescence, NFrP -number of fruits per inflorescence, NPP -number of inflorescence per plant, LL -leaf length, LW -leaf width and 100SW -100-seed weight

DISCUSSION:

Analysis of variance

The analysis of variance was done for 8 floral, leaf and seed characteristics in the populations of 15 different localities. All characters recorded highly significant variation at 1% level of significance at 12 month after planting (MAP) except leaf length, which was significant only at 5% and days to 50% of flowering, indicating that these traits were variable among the 15 populations in *Rauvolfia serpentina*. Moreover, the proportion of variation due to accessions (Populations) to the total variation was considerably higher in all most all the traits.

Phenotypic coefficient of variation

The relative amount of variation expressed by different characters can be properly judged through estimates of phenotypic coefficient of variation (Chawhaan *et al.,* 2003). Comparatively higher magnitude of percent coefficient of variability at phenotypic level indicated the presence of high amount of variability. In the present study, for many floral, leaf and seed characters viz. number of fruits per inflorescence followed by number of inflorescence per plant, number of flowers per inflorescence and leaf width studied, high coefficient of variance at phenotypic levels were observed. A number of various studies including Bhagat *et al.* (1980) in *Rauvolfia serpentina;* Vashistha *et al.* (2006) in *A. glauca and A. archangelica*; Brezinova *et al.* (2009) in *Papaver somniferum* are in agreement with these findings.

Association of characters

It was found that days to initiation of flowering showed significant positive correlation with days to 50% flowering, followed by 100-seed weight, and negative with number of inflorescence per plant, leaf length. Days to 50% flowering showed significant negative correlation with number of inflorescence per plant. Number of fruits per inflorescence showed significant positive correlation with leaf length and negative with 100-seed weight. Number of inflorescence per plant showed significant negative correlation with leaf length. Leaf length showed significant positive correlation with leaf width and negative association with 100 seed weight and indicating that these traits are genetically associated. These findings are similar to that of earlier findings by Shivanna *et al.* (2007) in *Solanum nigrum*; Kumar *et al*. (2008) in *Chlorophytum borivilianum*; and Dalkani *et al.*, (2011) in *Carum copticum*. Sharma et al (2022) in *Rauvolfia serpentine.*

Acknowledgements

Financial support from the National Medicinal Plants Board, Ministry of Health and Family Welfare, New Delhi (Sanction No. GO/MP/-07/2006) is gratefully acknowledged.

REFERENCES:

Bhagat, N. R., Mital, S. P. and Hardas, M. W., 1980, Variation in Rauvolfia serpentina Genetic resources in India. Euphytica, 29,**(15)**; 747-750

Brezinova, B., Macak, M. and Eftimova, J., 2009, The morphological diversity of selected traits of world collection of poppy genotypes (genus Papaver). Journal of Central Europe Agriculture, 10**(2)**, 183-190

Burton, G. W., 1952, Quantitative inheritance in grasses. Proceedings of Sixth International Grassland Cong, 7**(4)**, 277-283

Chawhaan, P. H., Khobragade, N. D. and Mandal, A. K., 2003, Genetic analysis of fruit and seed parameters in teak (Tectona grandis L. F.): Implications in seed production programme. Indian Journal of Genetics and Plant Breeding, 63**(21)**, 239-242

Dalkani, M., Darvishzadeh, R. and Hassani, A., 2011, Correlation and sequential path analysis in Ajowan (Carum copticum L.). Journal of Medicinal Plants Research, 5**(2)**, 211-216

Jain, S. P., Singh, J. and Singh, S. C., 2003, Rare and endangered medicinal and aromatic plants of Madhya Pradesh. Journal of Economic Taxon Botany, 27**(45)**, 925-932

Kumar, B., Verma, A. K., Singh, H. P., Misra, H. O. and Lal, R. K., 2008, Genetic Divergence and Correlations Study in Chlorophytum borivilianum. Journal of New Seeds, 9**(4),** 321 – 329

V. G. Panse and P. V. Sukhatme, Statistical Methods for Agriculture Workers. ICAR Publication New Delhi, 1967.

K. D. Rajendra. and L. Souza, In vitro propagation of ayurvedic plants, In Role of Biotechnology in Medicinal and Aromatic Plants, Khan, I. A. and Khanum, A. (eds.1999) Ukaaz Pub., Hyderabad, pp. 207-215.

Shivanna, J., Ravi, C. S. and Sreeramu, B. S., 2007, Character association and path coefficient analysis among economic traits in makoi (Solanum nigrum L.). Karnataka Journal of Agricultural Science, 20**(3)**, 575-577

V. E. Tyler, L. Y. Bradyand and J.E. Robbers, Pharmacognosy, 8th ed. Philadelphia, Lea and Febiger, pp. 20**(9)**;61-63, 1981.

Vashistha, R., Nautiyal, B. P. and Nautiyal, M.C., 2006, Conservation status and morphological variations between populations of Angelica glauca Edgew and Angelica archangelica Linn. In Garhwal Himalaya. Current Science, 91**(11)**, 1537-1542

Priyanka Sharma, Monish Roy and Bidhan Roy 2022, A review on influence of floral biology, pollination efficiency and conservation strategies of endangered medicinal plant, *Rauvolfia serpentina* (L.) Benth. Ex Kurz. Department of Seed Science and Technology, Faculty of Agriculture, Uttar Banga Krishi Vishwavidyalaya, Pundibari-736165, Coochbehar, West Bengal, India. Annals of Phytomedicine 11**(1)**: 86-98, 2022.

Sunil M. Akare Alka Chaturvedi Amit Kumar 2025, Reproductive biology of *Rauvolfia serpentina* (L.) benth. ex kurz. International Journal of Plant Research, DOI:10.1007/s42535-025-01214-0, Institute of Himalayan Bioresource Technology.