INTERNATIONAL RESEARCH JOURNAL OF CHEMISTRY (IRJC)
ISSN 2321 – 2845(Online), 2321 – 3299 (Print)

SINCE 2013

NAAS SCORE : 4.32 (2017 to 2020)

Received on:
20th January 2020

Revised on:
18th February 2020

Accepted on:
20th February 2020

Published on:
1st April 2020

Volume No.
Online & Print
30
Page No.
01 to 06

IRJC is an international open access print & online journal, peer reviewed, worldwide abstract listed, published quarterly with ISSN, Free- membership, downloads and access.

CORRELATION STUDIES ON NEEM (*Azadirachta indica* A. Juss) WITH RESPECT TO FLOWER TO FRUIT CONVERSION

PRABAKARAN, P*., KUMARAN, K., RADHAKRISHNAN, S. AND UMARANI, R.

DEPARTMENT OF FOREST BIOLOGY AND TREE IMPROVEMENT

FOREST COLLEGE AND RESEARCH INSTITUTE, TNAU, METTUPALAYAM – 641 301.

Corresponding author email: pprabufcri@gmail.com

ABSTRACT:

In the present study, ten plus trees were selected based on morphologically superior parents at Forest College and Research Institute, Mettupalayam, for investigation of flowering phenology of Neem (*Azadirachta indica*). From the observation 100 fruit weight and oil percent had significant high heritability and genetic advance this may indicate additive gene action among the traits. Inflorescence length and 100 fruit weight had high positive correlation followed by number of fruits per inflorescence with fruiting percent. Therefore, those phonological traits are used as a selection index for future genetic improvement studies of neem for high seed production.

KEYWORDS: *Plus tree, Phenology, Inflorescence, Genetic Improvement, Seed production.*

INTRODUCTION:

Neem tree is truly one of the Mother Nature's evergreen and most remarkable trees. It's belong to the family of Meliaceae, grows well in tropical and subtropical regions, native to Indian subcontinents. It distributed elevation upto 800m from sea level and tolerate wide environmental condition, not grown in water logged condition. Every part of neem can utilized, but major use in agriculture is plant protectant (biopesticide). Neem based pesticides are non-toxic to the environment because of being biodegradable compound (Bhat *et al.,* 2012).

Neem is a bisexual and functional male flowers present in same tree, but 95 percent of the fruit setting occurs through cross pollination by which neighboring parents (Singh *et al*., 1996). In general trees are produce flower and seed after planting 3-5 years and maximum fruit yielding from 10 after planting (Kandasamy and Raveendaran, 1998; Tewari, 1992). Flowering initiation at end of February, the time of flowering and fruiting various from site to site quality in India (Shanti *et al*., 1996). For the tree improvement programme knowledge of phonological behavior is must important for understand the evolutionary dynamics of the species (Jindal and Vir, 1994). In selection growth and yield are complex attributes to direct selection, therefore association characters also analyzed for indirect selection of traits (Kaushish *et al.,* 2011). The present investigation was undertaken to determine the genetic association studies on correlation between flowering and fruiting characters for tree improvement program.

MATERIAL AND METHODS

The ten plus trees were select and marked based on its morphological characters at Forest College and Research Institute, Mettupalayam, for investigation of flowering phenology of Neem (*Azadirachta indica*). The morphological characters viz., tree height, GBH (Girth at Breast Height), crown diameter and crown height were recorded (Table 1). The phonological observations viz., number of flowers per inflorescence, inflorescence length, number of frits per inflorescence, fruiting percent, 100 fruit weight, 100 seed weight and seed oil percent were recorded with 10 inflorescences each replication were randomly taken from flowering crown.

The phenotypic and genotypic coefficients of variance were computed following Burton (1952) formula:

$$PCV = \frac{\sqrt{Phenotypic\ variance}}{\bar{x}} x100 \qquad \text{and} \quad GCV = \frac{\sqrt{Genotypic\ variance}}{\bar{x}} x100$$

Broad sense heritability (h^2) was calculated according to Lush (1940) as $h^2 = \sigma^2 g / \sigma^2 p$, where $\sigma^2 g$ is genotypic variance and $\sigma^2 p$ is phenotypic variance. Genetic advance was worked out by the method given in Johnson *et al.* (1955). The correlation studies were worked out standard statistical procedure given by Goulden (1952).

RESULTS AND DISCUSSION:

The plus trees are identified and given the accession numbers like FCRI AZ 1 to FCRI AZ 10. The maximum height and crown diameter was recorded in FCRI AZ 7 respectively (Table 1). The results revealed that significant differences were observed on phonological traits among the ten plus trees of *Azadirachta indica* viz., number of flowers per inflorescence, inflorescence length,

number of frits per inflorescence, fruiting percent, 100 fruit weight, 100 seed weight and seed oil percent. FCRI AZ 3 is recorded significantly superior in number of flowers per inflorescence (41.20), number of frits per inflorescence (13.00), 100 fruit weight (143.80 g), 100 seed weight (26.73 g), seed oil percent (47.53 %) and followed by FCRI AZ 9 (Table 2). Genetic variability is an important tool for selection and further improvement of species. The value of range, mean, GCV, PCV, heritability, and genetic advance of flowering phonological traits are reported in Table 3. Phenotypic coefficient of variation was more than genotypic coefficient of variation for all phonological characters. Burten (1952) reported genotypic coefficient of variation along heritability would give efficiency of selection. The heritability and genetic advance were documented high in 100 seed weight (90.3%; 21.5) followed by oil percent (66.7%; 19.8). The characters giving high heritability and high genetic advance are controlled by the additive gene action (Pansa, 1957; Kumaran *et al.,* 1993; Kaushish *et al.,* 2011).

The correlation study (Table 4) among the phonological characters revealed that inflorescence length had positive significant correlation with 100 fruit weight followed by number of fruits per inflorescence with fruiting percent and negative correlation with 100 seed weight and oil percent both at genotypic level and phenotypic level. Number of flowers per inflorescence was positively correlated inflorescence length, number of fruits per inflorescence and 100 seed weight ant both genotypic and phenotypic levels. Similarly almost all characters are negatively correlated with oil percent, except number of flowers per inflorescence and 100 seed weight respectively. The result showed that the genotypic correlations are higher than the corresponding phenotypic correlations which indicate the presence of strong inherent association between inflorescence length and 100 fruit weight, number of fruits per inflorescence and fruiting percent, fruiting percent and 100 seed weight. These correlations exhibit the magnitude of association among the phonological traits this may helpful for future selection programme. The simple correlation indicates the relationship between floral characters in Neem already been reported by Jindal *et al.* (1997).

CONCLUSION:

The results of this investigation revealed that significant differences exist among ten plus trees on the basis of phonological characters within populations. Further genetic improvement of PTs for fruit and seed characters stands a high chance. 100 fruit weight and oil percent had significant high heritability, however genetic advance also high in 100 fruit weight followed by oil percent this may indicate additive gene action. Inflorescence length had high positive significant correlation with 100 fruit weight followed by number of fruits per inflorescence with fruiting

percent in this case both inflorescence length and numbers of fruit are important traits for future selection would help to limited objective of high seed production.

ACKNOWLEDGEMENT:

This study was carried as part of the collaborative research project between TNAU and Coromandel International Limited, Chennai funded by the Company, which is hereby acknowledged.

REFRENCES:

Bhat, I.A., Bhat, B., Vishwakarm, S., Verma, A., Saxena, G., 2012. Acute toxicity and behavioral responses of *Labeo rohita* (Hamilton) to a biopesticide "NEEM-ON". *Curr. World Environ*. 7, 175–178.

Burton G.W. 1952. Quantitative inheritance in grasses. In: *Proc. 6th int. Grassland congress*, 7:273-283.

Goulden, C.H. 1952. Some distance properties of latent root and vector methods used in multivariate analysis, *Biometrika.* 53: 325-338.

Jindal S.K. and Vir S 1994. Phenology, breeding system and seed production in Neem. *Van Anusandhan* 9:17-21.

Jindal S.K., Satyavir N. and Bhansali R.R. 1997. Variability and path analysis of shoot dry weight and other growth components in Neem. *Journal of Tree Science*, 16(1):39-42.

Johnson H.W., Robinsons H.F. and Comestock R.E. 1955. Estimates of genetic and environmental variability in Soyabean. *Agron. Journal*, 47: 314-318.

Kandaswamy A. and Raveendaran N. 1988. Productivity of neem trees in Tamil Nadu, India-An observational study. Paper presented at the Final Workshop of the IRRI-ADB-EWC Project on Botanical Pest Control in Rice-based Cropping Systems. IRRI, Los Banos, Philippines.10 pp

Kaushish S., Tewari J.C., Moola Ram and Tewari P. 2011. Study on relationship between various flowering attributes and heritability in Neem (*Azadirachta indica* A.Juss). *International Journal of Agriculture and Crop Sciences,* (3):85-87.

Kumaran K., Surendran C. and Rai R.S.V. 1993. Variation studies and heritable components of seed parameters in neem (*Azadirachta indica* A. Juss.). In: Proceedings of the World Neem Conference 1993, Bangalore, India, pp:167-173.

Lush KL. 1940. Intra-sire correlation and regression offspring on dams as methods of establishing heritability of characters. In: *Proc. Amer. Soc. Animal production*, 33:293-301.

Pansa V.G. 1957. Genetics of quantitative characters in relation to plant breeding. *Indian Journal of Genetic and Plant Breeding*, 17:318-328.

Shanthi K., Manimuthu L. and Singh B.G. 1996. Genetic significance of late flowering forms in neem (*Azadirachta indica* A. Juss.) as reflected by germination studies, *Indian Forester*, 122(3): 263-264

Singh V.P., Dhillon R.S. and Jhorar B.S. 1996.Floral biology, breeding behavior and breeding strategy in neem (*Azadirachta indica* A. Juss.). In: Proceedings of the International Neem Conference, niversity of Queensland, Australia.

Tewari D.N. (1992). Monograph on neem (*Azadirachta indica* A. Juss.). International Book Distributors, Dehradun, India, 279 pp.

Table 1. Morphological characters of different plus trees of Neem

Plus Tree	Height (m)	GBH (cm)	Crown Diameter (m)	Crown Height (m)
FCRI AZ 1	18.5	125.5	18.0	12.0
FCRI AZ 2	12.5	72.0	14.0	9.5
FCRI AZ 3	9.0	53.0	8.5	7.0
FCRI AZ 4	16.5	126.0	20.5	13.5
FCRI AZ 5	15.0	124.5	21.0	11.5
FCRI AZ 6	13.5	112.0	15.0	10.0
FCRI AZ 7	19.0	140.0	22.0	17.5
FCRI AZ 8	14.5	111.5	15.5	11.5
FCRI AZ 9	16.5	108.0	18.0	11.5
FCRI AZ 10	13.5	98.5	12.5	9.0

Table 2. Mean performance of PTs (plus trees) variation for reproductive trait in Neem

Plus Tree	No of flowers / inflorescence	Inflorescence length	No of fruits / inflorescence	Fruiting percent	100 fruit weight	100 Seed weight	Oil percent
FCRI AZ 1	29.80	12.42	5.80	19.63	108.64	21.46	39.25
FCRI AZ 2	32.40	15.23	8.20	23.33	96.74	21.35	43.55
FCRI AZ 3	41.20*	13.26	13.00*	38.13	143.80*	26.73*	47.53*
FCRI AZ 4	34.60*	15.36	7.80	19.57	122.08	18.03	41.32
FCRI AZ 5	28.60	13.04	6.80	24.91	87.80	17.84	41.64
FCRI AZ 6	27.80	18.42*	7.20	26.94	131.02	24.53	39.49
FCRI AZ 7	22.20	14.48	6.00	27.90	115.80	20.09	43.73
FCRI AZ 8	29.20	12.99	8.20	28.41	90.74	22.96	40.81
FCRI AZ 9	35.40*	20.72*	9.40*	30.90	128.78	22.78	40.14
FCRI AZ 10	27.60	13.91	8.80	32.27	146.38*	17.53	41.35
Mean	**30.88**	**14.98**	**8.12**	**27.20**	**117.18**	**21.33**	**41.88**
SED	**3.78**	**1.68**	**1.83**	**NS**	**4.50**	**2.04**	**1.10**
CD	**7.65**	**3.40**	**3.70**	**NS**	**9.09**	**4.12**	**2.22**

Table 3. Estimation of genetic variability, heritability and genetic advance in neem

Characters	Range	GCV	PCV	Heritability	Genetic advance
No of flowers / inflorescence	12 - 65	15.22	22.75	45.2	13.8
Inflorescence length	7 - 28	15.93	23.65	46.4	11.0
No of fruits / inflorescence	2 - 12	19.91	40.71	24.7	10.1
Fruiting percent	8 - 41	11.06	41.68	7.1	5.50
100 fruit weight	82 - 148	17.72	18.68	90.3	21.5
100 Seed weight	15.5 - 29.2	13.44	17.09	62.4	15.2
Oil percent	35.2 - 51.02	5.66	6.94	66.7	19.8

Table 4. Genotypic and phenotypic correlation coefficient among different traits of

Characters		No of flowers / inflorescence	Inflorescence length	No of fruits / inflorescence	Fruiting percent	100 fruit weight	100 Seed weight	Oil percent
No of flowers / inflorescence	G	1.000	0.084	0.564*	-0.272	-0.055	0.501*	0.589*
	P	1.000	0.244	0.256	-0.229	-0.078	0.339*	0.333
Inflorescence length	G		1.000	0.229	0.235	0.769**	0.142	-0.034
	P		1.000	0.110	-0.020	0.478*	0.077	0.074
No of fruits / inflorescence	G			1.000	0.729**	0.386*	-0.342*	-0.058
	P			1.000	0.353*	0.158	-0.138*	-0.044
Fruiting percent	G				1.000	0.701**	-1.034	-0.668
	P				1.000	0.174	-0.265	-0.159
100 fruit weight	G					1.000	-0.226	-0.195
	P					1.000	-0.132	-0.156
100 Seed weight	G						1.000	0.319
	P						1.000	0.265
Oil percent	G							1.000
	P							1.000

* 0.05% Significant level
** 0.01% Significant level