www.hortflorajournal.com

HortFlora Research Spectrum, 1(2): 168-171 (2012) Online Copy ISSN : 2250-2823

STUDY ON GENETIC VARIABILITY AND HERITABILITY IN *Ocimum spp.*

M. Shehbaz Khan, D.K. Bahuguna, Rajeev Kumar[1], Nitin Kumar[1] and Ishrat Ahmad Lone

Department of Seed Science and Technology, Ch.Charan Singh University, Meerut.

[1]*Department of Ag. Botany, CSSS (P.G.) College Machhra, Meerut.*

ABSTRACT: A field experiment was conducted during *kharif* season of 2008 to study the variability of 25 genotypes of *Ocimum spp.* for 11 traits. The estimate of maximum range and coefficient of variability were noted for six different characters including plant height, leaf length, no. of inflorescence/plant, length of inflorescence, days to maturity and fresh herb yield /plant. The highest estimates of heritability in broad sense were observed for plant height (99.70 %) followed by length of inflorescence /plant (98.80 %), fresh herb yield per plant (98.60%), no. of inflorescence/plant (98.40%), days to maturity (92.60%) and leaf width (91.50%). The highest value of genetic advance was obtained for fresh herbage yield per plant (1018.02) followed by dry herb yield per plant (394.31), no of inflorescence/plant (43.76) and plant height (39.13). Highest values of genotypic and phenotypic covariance indicated wide range of variability and high heritability associated with higher values of relative genetic advance.

Keywords : *Genetic variability, heritability, genetic advance, Ocimum spp.*

The genus *Ocimum* L. (*Lamiaceae*), collectively called basil comprises 30-160 annual and perennial herbs and shrubs native to tropical and subtropical regions of Asia, Africa and Central and South America (Paton, 12). Sweet basil, *Ocimum basillicum* L., is well known for its numerous economical, medicinal and aromatic values (Simon *et al.,* 16) and Morales and Simon, 10). Medicinally, it is useful in a variety of human and animal diseases treatment such malaria, colic, vomiting, common cold, cough and skin diseases (Bhattacharjee, 4). The importance of basil is increasing and has promising future in Egypt, especially, when cultivated in new reclaimed soil under organic agriculture conditions (Abd-El Raouf, 1; and Aboud *et al.,* 2). Genetic improvement in aromatic plants for quantitative characters is helpful for determination of yield components to improve oil yield through selection of genotypes from population (Kazmferezak *et al.,* 8; and Seidkr-Ozykowska *et al.,* 14). Genetic parameters estimating (PCV, GCV, h^2b and GA) are important to determine genetic variability among selected genotypes of different species of basil (De Masi *et al.,* 6; Nurzynska-Wierdak, 11). The objectives of this study were to determine the variation and genetic interrelationships among herb yield components of basil using genetic parameters.

MATERIALS AND METHODS

The present study was carried out during two successive growth seasons of 2008 at the farm of Department of Seed Science and Technology, C.C. S. University, Meerut. 25 *Ocimum* genotypes seeds were selected and sown in bed on 25 March. 35 days old seedlings were transplanted into field on 1st May 2008. All plants were fed by organic manure without any chemical nutrient addition. The plants were harvested 2 times (Cuts) during July and September in both seasons. Data recorded on the 25 genotypes from each replicate in both cuts for 11 characters included: plant height (cm), number of primary branches /plant, number of secondary branches / plant, days to flowering, leaf length (cm), leaf width (cm), number of inflorescence/plant, length of inflorescence (cm), days to maturity, fresh herb yield / plant (g) and dry herb yield / plant (g). A complete randomized block design with three replications was used in the experiment. The general statistical procedures was practiced according to Steel and Torrie (17). Analysis of variance (ANOVA) and broad sense heritability (h^2) were generally assigned for the data

Received : 21.3.2012 *Accepted : 12.4.2012*

of each season according to Robinson *et al.* (13). The phenotypic coefficient of variation (PCV) was computed according to Burton and DeVane (5). The expected genetic advance from selection (GA %) was computed according to Johnson *et al.* (7).

RESULTS AND DISCUSSION

Ocimum species is one of the most important medicinal herbs. A wide range of genetic variability exists in *Ocimum species*. In population, variability plays an important role for making effective selections. The environment plays an important role in determining the phenotypic expression of a particular genotype. Therefore, it is likely that all the genotypes may not express their full potential in a given environment. Hence, it is appropriate to evaluate the genotype at more the one location/ environment to derive conclusive information. In any breeding programme, the skilled knowledge to utilize genetic variability is an important factor. Better and desirable results could be achieved only if a breeder has the thorough knowledge of the material at hand in terms of variability, heritability, expected genetic advance and characters influencing the yield directly or indirectly. This helps proper in construction of selection indices for rapid and desirable improvement. The analysis of variance of the random block design experiment including a total of 25 germplasm accessions in *Ocimum species* were conducted for 11 characters. The mean squares for the different sources of variation are presented in Table 1. The mean squares due to treatment were significant for all the traits. This suggested significant differences among genotypes for all the characters.

The estimates for range and coefficient of variation (%) for the 11 characters on 25 genotypes of *Ocimum* spp. are given in Table 1. In the present investigation, wide range and coefficient of variability were noted for six different characters including plant height, leaf length, no of inflorescence/plant, length of inflorescence, days to maturity and fresh herb yield /plant. This suggested that for these six characters, high variability was available in the 25 *Ocimum* genotypes included in the present study. The variability for the remaining 5 characters including no of primary branches / plant, no of secondary branches / plant, days to flowering, leaf width was moderate. For the remaining only one character dry herb yield /plant showed low variability.

Heritability is an important selection parameter because heritability helps the plant breeder in selection of elite genotypes from genetically diverse population (Table 1). The highest estimates of heritability in broad sense were observed for plant height (99.70 %) followed by length of inflorescence /plant (98.80 %), fresh herb yield per plant (98.60%), no of inflorescence/plant (98.40%), days to maturity (92.60%) and leaf width (91.50%). Moderate heritability estimates were recorded for no. of primary branches / plant (73.20%), no. of secondary branches / plant (68.00 %), leaf length (59.50%) and leaf width (76.70 %). Low heritability estimates were observed only one remaining characters.

Genetic advance is an important selection parameter which helps the plant breeder in selection of elite genotypes from genetically diverse population in (Table 1). The highest value of genetic advance was obtained for fresh herbage yield per plant (99.02) followed by dry herb yield per plant (94.31), no. of inflorescence/plant (43.76) and plant height (39.13). A moderate estimate of genetic advance was observed for length of inflorescence /plant (11.08). In rest of the characters the genetic advance ranged from 0.48 to 5.13%. Thus, these characters may be utilized in further crop improvement programme. It may be possible to improve the fresh herbage yield per plant, seed yield per plant, plant height and dry herbage yield per plant as these characters exhibited high genetic advance. High heritability estimates in broad sense for plant height was also observed by Sharma (15) and Verma *et al.* (18).

Higher values of heritability showed lesser environmental and greater genetic effects. Highest values of genotypic and phenotypic covariance indicated wide range of variability and high

Table 1: Estimates of variability, heritability (h^2) and genetic advance (GA) of 11 quantitative characters in *Ocimum species.*

S. No.	Characters	Mean	Range	PCV	h^2	GA
1.	Plant height (cm)	88.52	63.07-127.73	21.51	99.70	39.13
2.	No. of primary branches per plant	4.42	2.40-6.87	27.19	73.20	1.81
3.	No. of secondary branches per plant	11.31	8.13-14.47	18.94	68.00	3.00
4.	Days to flowering	62.46	58.20-71.47	5.93	59.50	4.54
5.	Leaf length (cm)	4.47	3.00-5.67	13.67	91.50	1.15
6.	Leaf width (cm)	2.45	1.63-2.83	12.46	76.70	0.48
7.	No. of inflourescence per plant	83.12	53.00-130.27	25.97	98.40	43.76
8.	Length of inflourescence (cm)	17.53	7.83-27.27	31.07	98.80	11.08
9.	Days to maturity	119.64	116.80-127.63	2.25	92.60	5.13
10.	Fresh herb yield per plant (g)	2120.13	829.00-3075.00	23.65	98.60	1018.02
11.	Dry herb yield per plant (g)	1110.10	687.33-1744.33	38.35	45.00	394.31

heritability associated with higher values of relative genetic advance. It would employ that additive gene effect were more important and also estimated heritability for important morphological traits. This finding is in accordance with the results of Kirtikar and Basu (9) and Ahmad and Khaliq (3). The characters with high heritability coupled with high genetic advance would respond to selection better than those with high heritability and low genetic advance was suggested by Johnson *et al.* (7). In present investigation the character like fresh herbage yield per plant had high heritability coupled with high genetic advance.

REFERENCES

1. Abd-El Raouf, R.M.S. (2001). Production of sweet basil (*Ocimium basillicum*, L.) in the new reclaimed lands under different levels of biofertilizers and plant densities, *M.Sc. Thesis* Faculty of Agric., Ain Shams Univ., Cairo Egypt.
2. Aboud, K.A., Hussein, R.M. and Ibrahim, M.M. (2006). Genetic improvement for growth and oil yield of selected genotypes of some basil species under different types of organic fertilization. *J. Agric. Sci., Mansoura. Univ.*, **31** (8): 5249 – 5265.
3. Ahmad, S.D. and Khaliq, I (2002). Morpho-molecular variability and heritability in *Ocimum sanctum* genotypes from northern Himalayan region of Pakistan. *Pakistan J. Bio. Sci*. (Pakistan), **5**(10): 1084–1087.
4. Bhattacharjee, S.K. (1998). *A Hand Book of Medicinal Plants.* Pointer Pub. Jaipur, India, 241- 242.
5. Burton, G.A. and DeVane, E.H. (1953). Estimation of heritability in tall Festuca (*Festuca arundinacea*) from replicated clonally material. *Agro. J.,* **45:**478-479.
6. De Masi, L; Siviero, P., Esposito, C., Castaldo, D., Siano, F. and Laratta, B. (2006). Assessment of agronomic, chemical and genetic variability in common basil (*Ocimum basillicum* L.). *Euro. Food Res. Techno.* **223** : 273–281.
7. Johnson, H.W., Robinson, H.F. and Comstock, R.E. (1955). Estimates of genetic and environmental variability in soybean. *Agron. J.*, **49:** 314-318.
8. Kazmferezak, K. and Seidler-Ozykowska, K. (2001). Spice plants breeding in the Research Institute of Medicinal plants (Herbal plants-Cultivation and Universitatis, Mariiae Curie Skodawska Sectia EEE Horticulturea Wydawnictwa Uniwersytettu Marii Curie Skodowsktej,Lubliu,Poland. **9:** 307-310.
9. Kirtikar, K.R. and Basu, B.D. (1984). *Indian Medicinal Plants.* Lalit Mohan Pub. Allahabad, India, 3: 1965-67.
10. Morales, M.R. and Simon J.E. (1996). New basil selections with compact inflorescence for

the ornamental market. In: Janick (ed) Progress in new crops ASHS, Alexandria, pp 543–546.

11. Nurzynska-Wierdak, R. (2007). Evaluation of morphological, developmental variability and essential oil composition of selected basil cultivars. *Herba Polonicia,* **53** (3) 255-261.
12. Paton, A. (1996). Basil Taxonomy, *New Scientist* **9:** 7.
13. Robinson, H.F., Comstock, R.E. and Harvey, P.H. (1951). Genotypic and phenotypic correlation in corn and their implications in selection. *Agron. J.,* **43:** 282-287.
14. Seidkr-Ozykowska, K. and K. Kazmterezak (2001). Selective breeding of sweet basil, (*Ocimium basilciium* L). *Herba Polonica,* **47** (3): 187-190.
15. Sharma, Shailendra (2005). Genetic divergence analysis of some quantitative characters in basil (*Ocimum* species). *M.Sc. Ag. Thesis* submitted to CCS University, Meerut, U.P.
16. Simon, J. E., Quinn, J. and Murray, R. G. (1990). Basil: a source of essential oils. In: *Advances in New Crops*; Janick, J., Simon, J. E., Eds.; Timber Press: Portland, OR, pp 484–489 24.
17. Steel, R.G.D. and Torrie, J.H. (1980). *Principles and Procedures of Statistics*. A Biometrical Approach, McGraw Hill Book Co., New York, USA
18. Verma, P.K., Gupta, S.N., Khabiruddin, M. and Sharma, G.D. (1998). Genetic variability parameters for herb and oil yield in different *Ocimum* species. *Indian Perfumer,* **42** (1): 36-38.