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VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN SESAME

A. JOHN JOEL AND S. THANGAVELU
School of Genetics
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

Ninety five diverse genotypes of sesame were evaluated for variability and heritability estimates in 17 quantitative traits. Close resemblence between GCV and PCV estimates for 100 seed weight, capsule length, capsule breadth, oil content, days to 50 per cent flowering, days to maturity and seed number per capsule, and high heritibility for these traits indicated that selection for these characters would be much effective. The high heritability and genetic advance as per cent of mean for seed yield revealed predominance of additive gene effects.

KEY WORDS : variability, heritability, genetic advance,

In any crop improvement programme, variability present in a population and extent to which it is heritable are important factors to have effective selection. The present investigation was therefore undertaken to assess the variability in sesame and to determine its heritable components.

MATERIALS AND METHODS

Ninety five cultures of sesame, *Sesamum indicum* (L.) comprising 54 introduced and 41 indigenous lines broadly representing the existing variability of diverse geographic origins were chosen from the germplasm maintained at the School of Senetics, Tamil Nadu Agricultural University, Coimbatore. The experiment was carried out on loam soil of pH 7.3 at the oil seed unit of the School of Genetics, Tamil Nadu Agricultural University, Coimbatore. A randomised block design with three replications was adopted. Selfed seeds of each culture was sown in a single row of three m length with a spacing 45 x 15 cm. Observations were recorded on 17 characters on 5 plants selected at random for each genotype in each replication.

The mean values for each character were first analysed by the analysis of variance for which different variance components were computed. The genetic coefficients of variation (Burton, 1952), heritability estimates in broadsense (Lush, 1940) and the expected genetic advance (Johnson *et al.*, 1955).

RESULTS AND DISCUSSION

The analysis of variance for all the traits studied were highly significant. The range, the general mean and the standard error along with the variability estimates such as phenotypic coefficient of variation, genotypic coefficient of variation, heritability, genetic advance and genetic advance as per cent of mean are presented in Table 1. All the characters studied had higher phenotypic coefficient of variation (PCV) than genotypic coefficient of variation (GCV) except 1000-seed weight which showed equal values. Very high GCV estimates were obtained for number of secondaries, seed yield, number of capsules per plant and height to first fruiting branch indicating that these characters are amenable for improvement through selection. Gupta (1975) and Murugesan *et* *al.* (1979) also observed similar results for these characters. However, Desai *et al.* (1982) and Pathak and Dixit (1986) observed low GCV values for seed yield and capsules per plant.

Genetic coefficient of variation alone is not sufficient for determination of the amount of heritable variation and GCV simply measures the extent of genetic variability present for a character but does not assess the amount of genetic variation which is heritable, Hence, GCV should be considered in conjuction with heritability and genetic advance while assessing the effect of phenotypic selection.

In general, the heritability estimates were high for majority of characters. Lowest value of 71.84 per cent was recorded by 1000- seed weight and all other characters gave heritability estimates exceeding 80 per cent (Table 1). This indicated the greater effectiveness of selection and improvement can be expected for these characters in the breeding programme as the genetic variance is mostly due to additive action. Values exceeding 80 per cent for these characters were observed by many workers.

As the heritability estimates alone do not provide sufficient information for the genetic improvement that would result from the selection of best individuals, genetic advance was calculated to predict the net effect of selection. Five characters *viz.,* number of secondaries, seed yield per plant, number of capsules per plant, height to first fruiting branch and number of primaries exhibited very high magnitude of genetic advance as percentage of mean. To predict with high probability and good scope for selection, heritability was coupled with genetic advance as per cent of mean. The characters *viz.,* seed yield, 1000-seed weight, number of secondaries, number of primaries and seed number per capsule possessed high genetic advance as per cent of mean indicating that these characters are attributable to additive gene effects while internode length, capsule length and days to maturity had relatively low heritability associated with low genetic advance and these characters are attributable to non-heritable variation. The earlier studies also indicated high values for both heritability and genetic advance as per cent of mean for the above mentioned characters which is in accordance with this study.

The foregoing statements indicate that seed yield recorded high GCV, heritability and genetic advance as percentage of mean. A similar trend was also observed for number of secondaries, number of primaries and capsules per plant. The study indicates the possibility of improvement for

Table 1. Variability, heritability and genetic advance for certain characters in sesame

Characters	Range	Grand mean	SE (±)	PCV	GCV	Heritability (%)	Genetic advance	Genetic advance as % of mean
Plant height (cm)	54.77-108.75	76.15	4.04	16.42	15.08	84.33	21.72	28.52
Number of primaries	1.11-8.20	3.68	0.33	33.62	31.73	89.10	2.27	61:68
Number of secondary branches	0.00-5.16	0.92	0.35	116.29	106.44	83.78	1.85	201.09
Height of first capsule bearing node (cm)	12.86-63.67	33.59	3.38	27.62	24.72	80.08	15.30	45.55
Number of capsules on main stem	6.69-25.14	15.40	1.53	27.96	25.18	81.10	7.19	46.69
Number of capsules / plant	9.06-86.12	37.80	5.69	43.24	39.11	81.80	27.55	72.88
Internode length (cm)	3.04-5.63	4.08	0.27	15.29	12.96	71.84	0.92	22.55
Height to first fruiting branch (cm)	6.85-40.47	17.28	2.42	39.81	35.93	81.44	11.54	66.78
Capsule length (cm)	2.09-3.01	2.62	0.06	7.94	7.48	88.82	0.38	14.50
Capsule breadth (cm)	0.73-1.21	0.86	0.02	11.69	11.28	93.18	0.19	22.09
Seed number per capsule	40.66-124.44	57.80	2.48	19.73	19.02	92.92	21:83	37.77
1000 - seed weight	2.00-5.20	2,88	0.08	17.59	17.59	99.97	1.04	36.11
Days to first flowering	30.00-46.33	39.09	0.57	10.07	9.91	96.83	7.85	20.08
Days to 50% flowering	35.33-57.67	44.42	0.68	9.13	8.94	95.79	8.00	18.01
Days to maturity	78.67-107.67	88.71	1.00	5.09	4.90	92.64	8.62	9.72
Oil content (%)	35.60-56.93	52.15	0.53	6.80	6.69	96.66	7.06	13.54
Seed yield (g)	1.03-8.24	3.68	0.41	46.00	43.91	91.11	3.18	86.41

..ese characters by effective selection after ..ybridization.

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INFLUENCE OF CLIMATIC FACTORS ON UNIFORMITY IN SPRINKLER IRRIGATION

R.M. PADMANABHAN
College of Agricultural Engineering
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

Field experiment was conducted to assess the influence of climatic factors over the uniformity of water distribution with sprinkler irrigation system. The influence of the climatic factors, *viz.*, wind velocity, relative hymidity and atmospheric temperature over the uniformity coefficient was studied. Sixteen combinations of four nozzle diameters and four pressures were tried for each irrigation with *ragi* as test crop. It was found that wind velocity alone had high negative correlation with uniformity coefficient and the contribution of other factors was not significant.

KEY WORDS : Sprinkler irrigation, climatic factors, influence

Sprinkling method of irrigation has become ..opular all over the world owing to better water use ..fficiency and ease of operation. Its utility is much ..ealised in those areas which are not amenable for ..onventional methods of irrigation. Sprinklers suit almost all crops except water inundating crops like paddy and tall growing crops like sugarcane. In this system, water is applied at a rate lesser than the infiltration capacity of the soil and hence runoff and deep percolation losses are eliminated. However, the acceptance of the sprinkler system depends upon the degree of uniformity with which water is distributed to all parts of the field under irrigation.

Machmeier and Allred (1961) reported the distribution of watr from boom sprinklers and the factors affecting distribution including wind speed, boom rotation speed, nozzle angle of elevation and pressure. Ido seginer (1969) showed that changes of wind valocity (both speed and direction) has an important effect on the distribution of water from sprinklers, especially when laterals are moved across the field with time. Hollis shull and Dyll (1975) determined the effects of wind on water application pattern for a stationary single nozzle sprinkler. Suryawanshi *et al.* (1984) operated an isolated sprinkler under varying conditions of wind and pressure to study the effect on uniformity coefficient.

MATERIALS AND METHODS

A field experiment with *ragi* as test crop was conducted in a well drained sandy loam soil at TNAU Campus, Coimbatore, during *Rabi* 1992. An adjoining uncropped field was taken up as control for mass balancing of water. The sprinkler type