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Genetic analysis of yield in maize (*Zea mays* L.)

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Abstract : In 10 x 10 diallel analysis in maize, additive (D) and dominance (H1 and H2) components were found significant for plant height, number of grain rows per cob, number of grains per row, cob weight, hundred grain weight and grain yield. Dominance components (H1 and H2) were greater in magnitude than additive components for the above characters while additive (D) was found to be greater than dominant (H1 and H2) components for days to 50% silking. (***Key Words*** *: Maize, Genetic analysis, Additive and Dominance component, Diallel analysis)*

Maize (*Zea mays* L.) is an important cereal crop next to rice and wheat and it is one of the principle sources of carbohydrates and proteins. Yield contributing characters have considerable effect on seed yield. While improving seed yield such characters must be kept in mind to develop genotype with good yield. The understanding of genetics of such characters is of primary importance to decide breeding methods in order to achieve desired improvement in them. Hence an attempt has been made to generate information on quantitative inheritance of yield contribution characters.

Materials and Methods

All possible diallel crosses were attempted amongst ten parents *viz.*, UMI 492, UMI 561, UMI 743, UMI 760, UMI 805, Kesri 1, Prabhat 1, Pratap 1, Sartaj 1 and JM 3181 - 1 to generate 90 hybrids. The parents and F1s were planted in a randomized block design with two replications at Millet Breeding Station, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore during 1996-1997. Each genotype was represented by a single row plot of 5m length with 45 x 20cm spacing. The data were recorded in randomly selected ten competitive plants for all the characters (Table 1) except for phenological trait i.e., days to 50% silking which was recorded on population basis. The mean values were used for statistical analysis by adopting standard procedure and subsequently diallel analysis was done (Hayman, 1954).

Results and Discussion

The estimates of t^2 values are presented in Table 1. The estimates were nonsignificant for all the characters except for days to 50% silking and grain yield per plant. The nonsignificant t^2 test indicated the validity of the assumption underlying diallel analysis. The estimates of genetic components of variation together with related genetic parameter for various characters (Table 2) indicated that additive (D) and dominance (H1 and H2) components of variance were significant for all the characters. But the magnetite of dominance component was higher than additive component for all the characters except for days to 50% silking suggesting the importance of non additive gene effect for all the characters. Preponderance of non additive gene effect for these characters was reported and is in conformity with earlier reports (Piovarci, 1975; Mohammad, 1995 and Nagda *et al.* 1995). Preponderance of additive gene effect for days to 50% silking was also reported earlier (Singh *et al.* 1979 ; Sanghi *et al.* 1983 and Ali and Tepora 1986).

The symmetry of genes with positive and negative effects in parents was measured by H2 /H1 which should be theoretically equal to 0.25. For all the characters asymmetrical distribution of increasing and decreasing genes was observed in parental population. The value of kD / kR showed that the parents did not have equal proportion of dominant and recessive genes. The value of ($H1/D^{½}$) was above one for all the characters except days to 50% silking indicating the predominant role of dominance effect. In case of days to 50 silking ($H1/D^{½}$) is only 0.96 indicating the predominance of additive effects. High additive gene effects for flowering time in maize was also reported earlier (Daniel, 1972).

All the characters except days to 50% silking were under the influence of nonadditive genetic variance and hence improvement in all these traits could be made through heterosis breeding. In the trait days to 50% silking since additive component was greater in magnitude recurrent selection may be appropriate for accumulating genes for this trait.

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Table 1. Estimates of t^2 values for different characters in maize

S. No.	Characters	t^2
1.	Plant height	0.22
2.	Number of grain rows / cob	0.96
3.	Number of grains / row	3.77
4.	Cob weight	3.03
5.	Days to 50% sikling	26.553**
6.	Hundred grain weight	0.81
7.	Grain yield per plant	9.382**
8.	Starch cotent	2.76

** Significant at 1% level ; * Significant at 5% level

Table 2. Components of genetic variance and related parameters for different characters in Maize

Components	Plant height (cm)	No. of grain rows/cob	No. of grains/row	Cob weight (g)	Days to 50% silk	Hundred grain wt. (g)	Grain yield/ plant (g)
$\hat{D}$	96.06** ±15.56	1.31** ±0.47	1.32** ±3.40	411.80** ±80.47	8.22** ±1.00	5.52** ±1.63	92.37 ±84.43
$\hat{F}$	160.00** ±35.89	2.16** ±1.09	4.35** ±7.84	524.14** ±185.68	10.41** ±2.30	11.81** ±3.77	182.34 ±194.81
$\hat{H1}$	205.22** ±33.11	4.57** ±1.01	16.65** ±7.23	1349.72** ±177.30	8.13** ±2.13	21.89** ±3.48	582.80** ±179.72
$\hat{H2}$	160.11** ±28.14	3.10** ±0.86	12.33* ±6.14	1099.71** ±145.58	6.30** ±1.81	14.32** ±2.95	428.74** ±152.74
h2	172.69** ±18.8	5.59** ±0.57	-0.54 ±4.11	4.97 ±97.45	0.66 ±1.21	9.21** ±1.98	38.81 ±102.24
E	6.59 ±4.69	0.63** ±0.14	2.50 ±1.02	9.87 ±24.26	0.12 ±0.30	0.50 ±0.49	3.04 ±25.46
$(H1/D)^{1/2}$	1.00	1.87	3.55	1.81	0.96	1.99	2.51
H2/4H1	0.20	0.17	0.19	0.20	0.14	0.16	0.18
kD/kR	2.27	2.58	2.73	2.08	3.39	3.32	2.29
Heritability%(narrow sense)	74.22	20.95	5.59	32.25	87.36	31.33	18.29

** Significant at 1% level ; * Significant at 5% level

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Hydraulic design and performance evaluation of subsurface drip irrigation for coconut in Coimbatore district

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Abstract : Field experiments, conducted during 1993 to 1996 with subsurface drip irrigation (drippers are placed on the surface) for coconut in a farmer's field in Coimbatore showed that application of 112 lit/day/tree registered 133 nuts/tree/year. The water saving was 63 per cent in the drip over the conventional basin method. The yield increase was 7.25 per cent over the conventional method. In subsurface drip irrigation system, a labour saving of 75 per cent was recorded over the conventional method for irrigation work alone. (***Key Words** : Subsurface drip system, Sand filter, Mesh filter, Lateral, Micro tube and Drippers)*

The traditional coconut cultivation regions in the southern peninsular India spread over Kerala, Tamil Nadu, Karnataka and Andra Pradesh. Tamil Nadu ranks second in coconut production in the country with an area of 2,70,000 hectares and a production of 3282 million nuts. Coimbatore district pioneers coconut production in the state with the largest area of 57,384 hectares under the crop and production of 5224 lakh / nuts / year.

The present extent of area and the productivity of nuts should be increased with the help of improved conservation water management techniques as we have already utilized 95 per cent of the surface and 80 per cent of the ground water. Hence the only option to increase the extent of area and productivity are by adopting drip irrigation. Besides, the once abundantly available human labour force is slowly but steadily migrating to the industrial sector. So, the farming community in Tamil Nadu is facing not only the water scarcity problem but also agricultural labour force shortage problem in the agricultural sector.

Indian National Committee on Irrigation and Drainage (Sivanappan, 1994) reported that the water requirement in the drip irrigation was 100 lit/day/tree in Coimbatore district when compared to 300 lit/day/tree in conventional method for 15 year old tall variety of coconut.Yusuf (1988) reported that trip irrigation at the rate of 32 lit/day/tree registered 61 nuts/tree/year when compared to 43 nuts/tree/year under basin irrigation of 50 lit/day/tree for 8 year old coconut palm.

Only limited studies have been conducted in Tamil Nadu to find out the effect of subsurface drip irrigation system and its impact on water saving, labour and yield etc. Hence, a study was taken up by the Water Technology Center during 1993-96 to find out the effect of subsurface drip irrigation system and its impact on yield of coconut in Coimbatore.

Materials and Methods

A progressive farmer's field was selected in Coimbatore to conduct the study. The area consist of one hectare subsurface drip irrigation field and another one hectare conventional basin irrigation field. The soil type of experimented sites is Red loamy soil with average depth of 90 cm. The test crop in the test sites was 25 years old tall coconut variety. The irrigation water was pumped from a bore well with the help of 12.5 HP submergible pump.