;ese characters by effective selection after ;bridization.

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INFLUENCE OF CLIMATIC FACTORS ON UNIFORMITY IN SPRINKLER IRRIGATION

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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 popular all over the world owing to better water use efficiency and ease of operation. Its utility is much realised in those areas which are not amenable for conventional 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

Table 1. Coefficient of correlation between wind velocity and uniformity coefficient (N=40)

Treatments	N_1	N_2	N_3	N_4	P_1	P_2	P_3	P_4
R value	-0.7946	-0.8557	-0.9459	-0.8913	-0.8901	-0.9118	- 0.8758	-0.8446

N_1 = 3.97 mm x 2.38 mm — P_1 = 1.2 KSC
N_2 = 4.76 mm x 2.38 mm — P_2 = 2.5 KSC
N_3 = 5.56 mm x 3.17 mm — P_3 = 3.5 KSC
N_4 = 6.35 mm x 3.17 mm — P_4 = 4.0 KSC

employed in the study was twin nozzle, Single riser No.4 with rotary male connection.

Four nozzles of different diameters were employed under four operational pressures. The diameter of nozzles used in the study were (i) 3.97 mm X 2.38 mm (ii) 4.76 mm X 2.38 mm (iii) 5.56 mm X 3.17 mm and (iv) 6.35 mm X 3.17 mm. The pressures applied were 1.2 KSC, 2.5 KSC, 3.5 KSC and 4.0 KSC.

The required pressure was set by regulating the water flow through a gate valve fitted at the main line. The total quantity of water needed for each irrigation was equally divided into 16 parts and the crop was irrigated with all the 16 combinations of four nozzles and four pressures. However, the duration of operation was not constant as the discharge capacity of nozzles varied with their diameters. The quantity of water let into the system was measured with a water meter. The quantity reaching the soil surface was known through catch cans placed at a spacing of 3m X 3m in a square grid net work. The loss of water by drift was calculated by the method of mass balance after deducting evaporation component.

The data were subjected to statistical analysis without transforming the percentages since the data were assumed to be distributed normally.

RESULTS AND DISCUSSION

The effect of climatic factors including wi velocity, relative humidity and atmosphe temperature over uniformity of distribution sprinkler irrigation was estimated and presen below.

Among the factors, wind valocity alone h high negative correlation with uniformi coefficient as illustrated in Table 1 under vari treatments.

Even after adjusting the mean values uniformity coefficient according to wind veloc it was found that no other factor affected uniformity significantly. The relationship betw uniformity coefficient and wind valocity, relat humidity and atmospheric temperature we worked out under different treatments an presented in Table 2. The R^2 values we significant in all the equations and it range between 0.64 and 0.90 except under treatment P (3.5 KSC) where it was low. This may be due t the fact that wind affects the uniformity in tw ways, *viz.* by distorting the pattern and by causin non-uniform speed of rotation of the sprinklers. Wind acting on the rotating arm creates a imbalance of forces which cause the rotational speed to vary through out each revolution of nozzles. Those segments of fields where slower

Table 2. Relationship between uniformity coefficient and climatic factors (N = 40)

Under N_1 $Y_4 = 87.0377^* - 0.6791 X_1^* + 0.042 X_2 + 0.0863 X_3$, $R^2 = 0.6368$
Under N_2 $Y_4 = 77.0887^* - 0.7239 X_1^* + 0.0822 X_2 + 0.3611 X_3^*$ $R^2 = 0.7678$
Under N_3 $Y_4 = 80.785^* - 0.9249 X_1^* + 0.0648 X_2 + 0.3394 X_3$, $R^2 = 0.9015$
Under N_4 $Y_4 = 102.117^* - 0.5862 X_1^* - 0.1622 X_2 - 0.02265 X_3$, $R^2 = 0.8312$
Under P_1 $Y_4 = 84.4869^* - 0.7701 X_1^* + 0.0447 X_2 + 0.1857 X_3$, $R^2 = 0.7957$
Under P_2 $Y_4 = 80.5987^* - 0.7813 X_1^* + 0.0814 X_2 + 0.2518 X_3$, $R^2 = 0.8420$
Under P_3 $Y_4 = 30.3044 + 1.1213 X_1^* - 0.2691 X_2 - 0.0751 X_3$, $R^2 = 0.6161$
Under P_4 $Y_4 = 90.7832^* - 0.8263 X_1^* + 0.01149 X_2 + 0.0626 X_3$, $R^2 = 0.7143$

X_1 = Wind Velocity	N_1 = 3.97 mm x 2.38 mm	P_1 = 1.2 KSC
X_2 = Relative humidity	N_2 = 4.76 mm x 2.38 mm	P_2 = 2.5 KSC
X_3 = Atmospheric temperature	N_3 = 5.56 mm x 3.17 mm	P_3 = 3.5 KSC
Y_4 = Uniformity coefficient	N_4 = 6.35 mm x 3.17 mm	P_4 = 4.0 KSC

* Significant at 5% level.

speeds prevail receive greater amount of water than the segments associated with faster rotation.

Among the three climatic factors, wind valocity alone had significant negative regression coefficient indicating that as the wind valocity increased the uniformity decreased. Relative humidity and atmospheric temperature had little effect on uniformity coefficient.

From the above data it is clear that wind velocity is the dominant factor to affect the uniformity of water distribution. Hence, it is advisable to operate the sprinklers under low / no wind conditions.

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GENETIC DIVERGENCE IN BLACK GRAM

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ABSTRACT

A group of 30 strains of black gram collected from different geographic regions of India was studied to analyse the extent of genetic divergence using Mahalanobi's D^2 technique. The strains got grouped into eight clusters and the clustering pattern was independent of geographic distribution. Characters, pod yield and seeds/pod were found to be important contributors to genetic divergence.

KEY WORDS : Black gram, genetic divergence

The success of a breeding programme through hybridisation is highly dependent on genetic divergence of parents involved. The utility of analysis of genetic divergence in discriminating population with diverse geographic origins has been emphasised already (Murthy and Arunachalam, 1966). In self pollinated crops, the choice of parents for hybridisation largely depends on wide adaptation, genetic variability and high yield potential. Hence, the present investigation was taken up to estimate the genetic divergence among 30 strains of black gram *Vigna mungo* L. Hepper with diverse geographic origin.

MATERIALS AND METHODS

The materials comprised of 30 strains of black gram (from various parts of India) grown in a randomised block design with three replications at the Pulses Breeding Station, Tamil Nadu Agricultural University, Coimbatore. The plots were single rows of 3 m length with inter - and intra - row spacings of 45 cm and 15 cm, respectively. Observations were recorded for eight economic traits *viz.*, plant height (cm), number of branches, number of pod/clusters, pod length (cm), number of seeds/pod, number of pods/plant, pod yield/plant (g) and seed yield/plant (g).

Following the analysis of variance, the data were subjected to multivariate analysis and the diversity of characters was studied using D^2 technique (Rao, 1952). Contribution made by various characters towards divergence was computed by the ranking of characterwise D^2 values for all possible pairs of combinations of the 30 strains (435 pairs).

RESULTS AND DISCUSSION

Analysis of variance (ANOVA) of plot means revealed highly significant differences for all the eight characters indicating the existence of genetic