

"Investigation into differential behaviour of different tobacco genotypes to various degrees of drought and reasons thereof".

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Tobacco having diverse types is grown in different agro-climatic regions under varied soil and weather conditions. It is grown as a rainfed crop both in light as well as heavy soils. Since most of the light soil areas of India where tobacco is being grown extensively are drought prone, there is an element of instability of yields over time scale. The present investigation comprising of four parts was therefore, undertaken to find out the mechanism and genetics of drought resistance as an aid to efficient formulation of breeding programmes to evolve drought resistant types.

Expressivity of tobacco traits in relation to soil moisture stress : This study was conducted for two years viz., 1973-74 (Normal) and 1974-75 (drought) using 17 tobacco genotypes viz., 530-51-36-87, 543-37-54-23-84, 388-28-43-25-89, 46-46-12-9-88, 2-42-16-51-88, 428-26-10-84, 169-119-26, 82-54 Sh. R.Pl.1. Sh.R.Pl.2, Anand-2, 16-103-3/14, NC 75, Florida 301, I-305 V.V., Green Briar, Harrow velvet and Grout Swasie encompassing five tobacco types and three levels of irrigation (a) no irrigation, (b) irrigation to maintain soil moisture from 30 to 100 per cent available soil moisture and

(c) irrigation to maintain 60 to 100 per cent available soil moisture. Split plot design was used for this purpose and soil moisture levels were relegated to main plots. Differences due to the levels of irrigation were non-significant for agronomical characters like days to flower, plant height, number of curable leaves, leaf area, cured leaf yield and wilting nature. Significant differences due to soil moisture levels were observed for stomal length and number of stomata. Differences due to years were significant for days to flower and all genotypes flowered earlier during 1974-75, the drought year. The genotypes differed significantly for the traits days to flower, plant height, number of curable leaves, leaf area, cured leaf yield, wilting nature, number of stomata, number of epidermal cells, guard cell length, guard cell width, stomal length and stomal width.

The genotypes x years interaction was significant for all traits barring stomal width and guard cell width. The bidi genotypes had higher stomatal frequency and stomatal area alongwith nonwilting ability. Thus the bidi genotypes 530-41-36-87, 543-37-54-23-84, 388-28-43-25-89, 46-46-12-9-88, 428-26-10-84, 169-119-26 and Anand-2 were found to be drought resistant.

Seed germination in mannitol solutions : The experimental findings reveal that 7.5 atmospheres (atm) mannitol solution was optimum upper limit for testing the germinability of tobacco seed to assess the genotypes for drought resistance. The seeds of 17 genotypes mentioned in section-1 were germinated in 0, 2.5, 5.0 and 7.5 atm mannitol solutions. The germinability

of tobacco seed decreased with the increase in the concentration of mannitol solution. The genotypes showed differential response to the levels of osmotic solutions indicating genetic base for the character, seed germination ability in mannitol solution. Highly significant positive association was observed between seed germination index and nonwilting ability of the genotypes under field conditions. The genotypes 530-51-36-87, 543-37-54-23-84, 46-46-12-9-88 and 428-26-10-84 showed high osmotic potential alongwith drought resistance under field suggesting that these genotypes could be used as donors for drought resistance.

Chemical composition of tobacco in relation to soil moisture stress: This experiment was conducted during 1974-75 to study the effect of soil moisture stress on the chemical composition of tobacco genotypes. Total nitrogen, nicotine, potash contents and ratio of total nitrogen to nicotine contents of two drought resistant (530-51-36-87 and 543-37-54-23-84) and three drought susceptible (16-103-3/14, NC 75 and Florida 301) genotypes and their four hybrids viz., (530-51-36-87 $\times$ 16-103-3/14), (530-51-36-87 $\times$ NC 75), (530-51-36-87 $\times$ Florida 301) and (543-37-54-23-84 $\times$ Florida 301) were studied at two levels of irrigation—(a) no irrigation and (b) irrigating the plots to maintain 100-60 per cent available soil moisture. Nonsignificant differences due to soil moisture levels were observed for all chemical

traits. The genotypes differed significantly for nicotine and potash contents although the values for the latter were of lower order. The interaction between genotypes and irrigations was significant for total nitrogen. The drought resistant genotypes in general had higher nicotine and potash contents.

Genetics of drought resistance in tobacco: To investigate the genetics of the agronomical as well as anatomical traits in relation to drought resistance, four populations were studied. Each population comprised drought resistant and susceptible parents, their F_1 , F_2 and back-cross generations involving either parent. The study was conducted during 1974-75 under rainfed conditions using compact family block design. All traits barring guard cell width and stomal length showed significant genetic variability in all crosses. Nonadditive gene effects with predominancy of epistacy influenced the agronomical as well as anatomical traits studied. The negative heterotic values were observed for days to flower, plant stature, number of stomata and number of epidermal cells. Thus the bidi tobacco genotypes 530-51-36-87, 543-37-54-23-84, 46-46-12-9-88 and 428-26-10-84 were found to be good donors for drought resistance and based on the information of gene effects a cyclic method of breeding keeping adequate population would be more desirable to evolve drought resistant tobacco cultivar superior in yield and quality traits.