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Inducing Drought Tolerance in Bajra (*Pennisetum typhoides* Stapf & Hubb) by Pre-sowing Seed Treatment

By

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ABSTRACT

In this study HB 3 Bajra (*Pennisetum typhoides* Stapf & Hubb) was subjected to different pre-sowing treatments namely, hardening (water), CCC, ethrel, kinetin and resistine. The seedlings were raised in germination trays and the study was confined to 30 days. The pre-treatments improved the water retaining capacity of plants in desiccation test among which CCC was effective. The treatments reduced the transpiration rates. During the stages of seedling growth CCC increased the diffusion pressure deficit of cells.

INTRODUCTION

From time to time many pre-treatments of seeds have been suggested for inducing resistance to drought. Urs *et al.* (1970) studied the effect of hardening on a few rice varieties and reported that the technique was effective to the extent that drought tolerance was increased. Halevy and Kessler (1963) were able to induce tolerance of bean plant to soil drought by application of chemicals like Cycocel. The present study is to measure the induced drought tolerance in Bajra by some of these methods.

MATERIALS AND METHODS

HB3 cumbu was chosen and the treatments shown in the tables were given. The study was confined to 30 days from sowing, samples being collected on 8th, 15th, 22nd and 30th days of the crop growth. At each stage representative samples from four trays were taken and pooled for analysis. Using approved procedures, evaluation for drought resistance was done by Chlorophyll Stability Index, chlorophyll content, relative turgidity test, transpiration rate and Shardakov's test for D. P. D.

RESULTS AND DISCUSSION

The chlorophyll stability index (C. S. I) test (Table 1) shows that all

TABLE 1. Chlorophyll Statbility Index (CSI) in relation to treatments expressed as differences in O. D

Tr. No.	Treatments	I 8 C.S.I	II 15 C.S.I	III 22 C.S.I	IV Stages 30 days C.S.I
C	Control	0.13	0.16	0.18	0.20
T_1	Hardening	0.08	0.11	0.11	0.19
T_2	CCC-5 ppm	0.02	0.04	0.07	0.16
T_3	Ethrel-5 ppm	0.06	0.09	0.10	0.18
T_4	Kinetin-5 ppm	0.03	0.04	0.07	0.16
T_5	Resistine-10ppm	0.04	0.05	0.08	0.17

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the treatments induced drought resistance. Among the treatments Cycocel was better and hardening had the least influence.

The data (Table 2) indicate that the treatments increased chlorophyll 'a' as compared to the control and Cycocel was comparatively better thus confirming the finding of Virgin (1965). Thus it was evident that Cycocel and other treatments enabled the cells to maintain turgidity within limits of water stress. As regards to chlorophyll 'b' there was no relationship between the treatments and the degree of tolerance to drought. Total chlorophyll was enhanced slightly by Cycocel and resistine. Negbi and Rushkin (1966) and Kessler *et al.* (1967) were of the view that Cycocel inhibits chlorophyll synthesis and as such may not help in improving the status of tolerance to drought.

TABLE 2. Effect of treatment on chlorophyll 'a', chlorophyl 'b' and total chlorophyll (mg/g).

Tr. No.	Treatment	I 8			II 15			III 22			IV Stages 30 Days		
		a	b	Total	a	b	Total	a	b	Total	a	b	Total
C	Control	0 44	0.31	0.75	0.53	0·44	0.97	0.61	0.47	1.08	0.49	0.40	0.89
T_1	Hardening	0.50	0.31	0.81	0.55	0.45	1.00	0.62	0.52	1.14	0.52	0.46	0.98
T_2	CCC-5 ppm	0.61	0.39	1.00	0.69	0.54	1.23	0.73	0.55	1.28	0.57	0.49	1.06
T_3	Ethrel-5 ppm	0.53	0.44	0.97	0.66	0.56	1.22	0.68	0.59	1.27	0.54	0.51	1.05
T_4	Kinetin-5 ppm	0.49	0.33	0.82	0.54	0.46	1.00	0.61	0.48	1.09	0.51	0.43	0.94
T_5	Resistine-10 ppm	0.59	0.44	1.03	0.60	0.52	1.12	0.67	0.54	1.21	0.57	0.46	1.03

The results furnished in Table 3 show that the relative turgidity was improved uniformly by all the treatments. although resistine and Cycocel had comparable effects. Levitt (1959) Milthorpe (1959) and May *et al.* (1962) have shown that an increase in relative turgidity of the cells induce tolerance to drought. Desiccation test has been suggested by May and Milthorpe (1962) for assessing the degree of tolerance to drought. The data from Table 4 show that all the treatments were effective in creating low water loss compared to the control.

TABLE 3. Effect on treatments on Relative Turgidity

Tr. No.	Treatments	I 8 R.T	II 15 R.T	III 22 R.T	IV Stages 30 days R. T
C	Control	69.0	78.1	85.4	82.5
T_1	Hardening	72.8	85.8	90.1	85.7
T_2	CCC - 5 ppm	79.9	91.4	97.7	90.1
T_3	Ethrel - 5 ppm	77.7	87.7	90.5	89.1
T_4	Kinetin - 5 ppm	78.9	89.7	95.9	89.7
T_5	Resistine-10 ppm	78.7	88.1	91.7	89.5

TABLE 4. Effect of treatments on percentage of water loss by desiccation expressed in per cent

Tr. No.	Treatment	I 8		II 15		III 22		IV Stages 30 days	
		After 24 hours	After 48 hours	After 24 hours	After 48 hours	After 24 hours	After 48 hours	After 24 hours	After 48 hours
C	Control	92.1	94.0	91.9	93.0	88.7	90.0	85.6	88.8
T_1	Hardening	90.4	91.5	88.4	90.6	84.3	87.0	78.7	83.8
T_2	CCC-5 ppm	88.5	90.0	84.6	88.6	82.1	84.7	76.1	81.8
T_3	Ethrel-5 ppm	90.7	91.6	90.0	90.7	85.3	87.9	80.6	84.8
T_4	Kinetin-5 ppm	90.3	91.3	87.9	90.4	82.3	85.1	77.5	82.3
T_5	Resistine-10 ppm	90.1	91.2	84.8	89.9	83.8	85.9	77.7	83.7

Among the treatments (Table 5) kinetin was very effective in lowering the transpiration rate to a considerable degree thus indicating that transpiration rates in plants are directly related to water content in leaf as well as stomatal mechanism.

TABLE 5. Effect of treatments on transpiration rate, expressed as percentage of water loss in 30 minutes

Tr. No.	Treatment	I 8 TR	II 15 TR	III 22 TR	IV Stages 30 days TR
C	Conrol	12.20	13.90	15.45	13.12
T_1	Hardening	9.25	12.85	12.17	12.72
T_2	CCC-5 ppm	9.10	12.55	11.90	12.67
T_3	Ethrel-5 ppm	7.20	11.40	9 77	9.37
T_4	Kinetin-5 ppm	6.50	11.15	9.85	10.87
T_5	Resistine-10 ppm	7.50	12.50	11.60	11.87

Between the susceptible and resistant varieties quite a difference has been noted in the osmotic values based on which the Shardakov's test has been proposed. In the present studies (Table 6) Cycocel enhanced the O. P. considerably and this may be one of the resultant factors of these treatments.

TABLE 6. Shardakov's test in relation to treatments expressed in D.P.D. (atm.)

Tr. No.	Treatments	I 8 D.P.D.	II 15 D.P D.	III 22 D.P.D.	IVStages 30 days D.P.D.
C	Control	12.30	12.30	12.30	13.53
T_1	Hardening	13.53	13.53	13.53	14.77
T_2	CCC-5 ppm	14.76	14.76	14.76	16.00
T_3	Ethrel-5 ppm	13.53	13.53	13.53	14.77
T_4	Kinetin - 5 ppm	13.53	13.53	13.53	14.77
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Genkel (1961) was able to show a high viscosity and elasticity of protoplasm as a result of pre-hardening.

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Quality of Irrigation Water of Sankari Taluk

By

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ABSTRACT

Twenty four water samples from open wells of Salem District were analysed for pH, E. C., and concentration of soluble salts present. Soluble sodium percentage (S.S.P), residual sodium carbonate (R.S.C) and sodium absorption ratio (S.A R) values for the water samples were determined. The water samples were graded based on the quality. The suitability of the samples was indicated for raising of different crops.

INTRODUCTION

The water used for irrigation, favours mostly for good cropping but at times harm the crop by causing salinity and alkalinity in the soil. Development of salinity and alkalinity depend upon the quantity and quality of ions present in the irrrigation water. The quality is determined by its composition and concentration of soluble salts and the harmfulness depends on the nature of the soil to be irrigated, nature of the crop to be grown and the climate of the locality. Eaton (1950) classified irrigation water based on the excess of carbonates and bicarbonates over the lime content. The suitability of water for irrigation was classified based on the quality of water, texture and permeability of the soil and the type of crops to be raised (Govinda Iyer *et al.*, 1972). Venkatachalam (1958) reported that the irrigation waters have to be studied in conjunction with the soil irrigated. Rangasamy *et al.* (1959) proposed the ionic composition as a basis for assessing the suitability of ground waters for irrigation. An attempt has been made in this paper to collect information about the quality of water in Sankari taluk and to discuss about their suitability for irrigation.

MATERIALS AND METHODS

Twenty four water samples from open wells were collected at random from Sankari taluk of Salem district, Tamil Nadu which were utilized for irrigating paddy, sugarcane, cholam and groundnut. The water samples were collected in two batches in the same season. The composition and concentration of soluble salts, were deter-

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