

The crop sown earlier required more period for attaining the various growth stages. Due to sufficient moisture available during the crop growth stages and reverse was the case in delayed sown condition. Therefore the plants completed their life cycle in the shorter period under delayed sown conditions.

The data also reveal that the coefficient of variation was high during seedling and button formation stage of sunflower crop, while it was branching and start of flowering stage in red gram. There was no clear variation between other stages. The heat units required to attain harvest stage marginally differed within the years under all sowing dates, as evidenced from coefficient of variation values.

The regression equation between GDD and number of days required to attain various physiological growth stages was worked out for sole sunflower and sunflower intercropped with redgram and intercropped redgram depicted in Fig. 1 and 2a and 2b. The equations were as follows:-

Sole sunflower

$$Y = 20.54 + 16.68 \times R^2 = 0.97$$

Intercropped sunflower

$$Y = 2.25 + 17.11 \times R^2 = 0.92$$

Intercropped Redgram

$$Y = 134.83 + 23.68 \times R^2 = 0.94$$

Where Y = Accumulated growing degree days.

X = Number of days required to attain growth stage.

From this equation and by knowing the number of days required to attain the growth stage the GDD can be worked out for sole sunflower intercropped with redgram and intercropped red gram grown under dryland conditions.

Therefore, for accumulating more GDD and to obtain better production the sunflower and sunflower + redgram intercropping be sown in 2 and 25th M.W. under scarcity zone of Maharashtra.

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SODIUM CHLORIDE NUTRITION IN COCONUT

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Field experiment was conducted at the Agricultural Research Station, Aliyarnagar during 1989-1994 to study the effect of sodium chloride (NaCl) application to coconut. The results revealed that application of NaCl @ 1 kg/tree/year along with recommended dose of NPK, significantly influenced the growth and nut characters and nut yield of coconut. There was no residual sodium available in the soil to cause sodium toxicity after application.

KEY WORDS : Coconut, Common Salt, Quality Features, Residual Toxicity

Application of common salt (sodium chloride) to the base of the coconut palms as well as in the crowns is an age old practice among the coconut cultivators in India (Ramanathan, 1973). Sodium

Table 1. Effect of NaCl on growth characters of coconut

Treatment	Girth at base (m)	Girth at collar. (m)	Height of trunk (m)	No. of functional leaves	Length of petiole (m)	Length of leaf bearing portion (m)	Length of middle leaflet (m)	Breadth of middle leaflet (cm)	No. of bunches with buttons	No. of female flowers produced
T ₁	0.82	0.81	4.62	24.6	1.43	3.89	1.19	6.1	1.50	3.66
T ₂	0.83	0.83	4.92	29.3	1.56	3.97	1.20	5.6	2.08	5.30
T ₃	0.73	0.82	4.45	28.6	1.41	3.85	1.28	5.6	2.43	5.13
T ₄	0.89	0.85	5.03	30.4	1.50	4.05	1.29	6.1	2.86	5.63
T ₅	0.78	0.78	3.91	28.0	1.41	3.80	1.31	5.9	1.66	4.76
T ₆	0.87	0.85	4.91	28.0	1.41	3.60	1.23	6.6	2.60	4.10
T ₇	0.82	0.82	4.82	29.3	1.48	3.74	1.23	6.0	2.70	5.03
T ₈	0.86	0.80	5.71	28.9	1.48	3.74	1.23	6.0	2.70	5.03
T ₉	0.87	0.83	5.02	29.2	1.42	3.84	1.26	6.2	2.03	5.05
T ₁₀	0.88	0.84	5.07	28.6	1.48	3.85	1.26	6.0	2.36	5.26
SE _D	0.03	0.024	0.3	1.20	0.07	0.098	0.035	0.02	0.60	1.08
CD	NS	NS	NS	NS	NS	0.205	0.07	0.04	1.12	2.26

itself might be a nutrient or it can make available more important potassium in the nutrition of palm (Magert *et al.*, 1988). Though application of sodium chloride is practiced by the coconut growers in Tamil Nadu, the knowledge on its dose and combination with potassium chloride (KCl) is lacking and this study was taken up to find out the combined effect of KCl and NaCl on coconut.

MATERIALS AND METHODS

The experiment was conducted at the Agricultural Research Station, Aliyarnagar, Tamil Nadu, with 9 year old West Coast Tall palms. The experiment was conducted during 1989-1994. The experimental soil had a pH of 7.3 with low,

medium and low status of available N, P, and K respectively. The treatments included T₁ - Control; T₂ - recommended dose of NPK; T₃ - T₂ + 0.5 kg NaCl; T₄ - T₂ + 1 kg NaCl; T₅ - T₂ + 1.5 kg NaCl; T₆ - T₂ + 2 kg NaCl; T₇ - recommended dose of NP + 1.5 kg KCl + 0.5 kg NaCl; T₈ - recommended dose on NP + 1kg KCl + 1kg NaCl and T₁₀ - recommended dose of NP + 2 kg NaCl. The fertilizers were applied twice in a year. The experiment was conducted in a randomised blocks design with three replications. To maintain homogeneity in the experimental plot, stabilised trees for nut yield were selected at the rate of 4 trees/treatment and pre-treatment observations on growth characters recorded.

Table 2. Effect of NaCl on nut characters of coconut

Treatment	Whole nut weight (kg)	Husked nut weight (kg)	Water content (ml)	Husk weight (kg)	Meat weight (kg)	Shell weight (kg)	Copra weight (kg)
T ₁	1.750	0.590	180	0.590	0.210	0.143	0.125
T ₂	1.810	0.610	190	0.605	0.230	0.150	0.130
T ₃	1.812	0.601	185	0.590	0.225	0.150	0.128
T ₄	1.815	0.647	195	0.620	0.255	0.155	0.132
T ₅	1.805	0.597	183	0.595	0.235	0.145	0.129
T ₆	1.790	0.582	175	0.590	0.230	0.140	0.127
T ₇	1.795	0.585	178	0.580	0.210	0.142	0.123
T ₈	1.815	0.650	205	0.625	0.235	0.152	0.130
T ₉	1.805	0.625	190	0.610	0.235	0.152	0.131
T ₁₀	1.812	0.645	200	0.623	0.237	0.150	0.129
SE _D	0.05	0.04	21	0.03	0.004	0.02	0.019
CD	0.11	0.09	NS	0.06	0.010	0.05	0.04

Table 3. Effect of treatments on nut yields of coconut

Treatment	Pre-treatment 1988	1989	1990	1991	1992	1993	1994	% increase over control
T ₁	42	42	42	43	47	47	55	-
T ₂	43	44	45	49	52	55	65	18
T ₃	45	47	49	56	61	63	68	23
T ₄	45	51	55	57	63	68	71	29
T ₅	48	51	53	57	63	65	68	23
T ₆	46	49	53	55	62	64	67	21
T ₇	43	47	50	54	60	60	62	12
T ₈	44	46	49	55	58	61	63	15
T ₉	43	45	48	51	54	63	66	20
T ₁₀	45	49	54	57	59	60	62	12
SE _D	0.11	0.19	0.74	2.1	1.9	0.20	0.57	-
CD	0.23	0.40	1.55	4.4	3.9	0.40	1.20	-

RESULTS AND DISCUSSION

Effect of NaCl on growth characters

The growth characters *viz.*, number of functional leaves, length of leaf bearing portion, width of middle leaf let, number of bunches with buttons and number of female flowers (buttons) produced were significantly influenced by the application of recommended dose of NPK NaCl @ 1 kg/tree/year (Table 1). Sodium chloride @ 1-1/2 kg, along with the recommended dose of NPK influenced the length of middle leaflet.

Effect of NaCl on nut characters

The whole nut weight was more than 1.80 kg for the treatments with NaCl application (Table 2). Higher nut weight was obtained with recommended dose of NPK + NaCl @ 1 kg/tree/year. Sodium chloride at higher rate with NPK and partial substitution with KCl reduced the nut weight. Similar trend was obtained with husked nut weight also. Higher husked nut weight was obtained with NPK NaCl @ 1 kg/tree/year. Application of NaCl also influenced the water content in the nut. Higher husk weight was obtained with NPK + NaCl @ 1 kg/tree/year. Similar trend was seen in shell and copra weight also. Maintenance of water status of coconut, improvement in gaseous exchange and CO₂ assimilation, correction of deficiencies by improved nutrition all contributed by the application of NaCl to coconut palms (Markose, 1989 Jayasekara *et al.*, 1993) and resulted in good quality nuts.

Effect of treatments on yield of nuts

The average yield on nuts in the pre treatment period ranged from 42 to 48 nuts/tree/year (Table 3). Increased nut yield was obtained over years of treatment. In all the years of observation, the cumulative nut yield was higher with NaCl application. The treatment, application of recommended dose of NPK along with NaCl @ 1 kg/tree/year resulted in significantly higher cumulative nut yield in all the years of observation. In general, application of NPK and NaCl resulted in higher nut yield over control in all the years of observation. There was 29 per cent increased nut yield in recommended dose of NPK + NaCl @ 1 kg/tree/year over control.

The post-treatment soil analysis showed that the residual sodium available in the soil was very low to cause sodium toxicity to coconut and so NaCl @ 1 kg/tree/year along with recommended dose of NPK can be safely applied to get higher yields in coconut.

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