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Influence of seed hardening chemicals on growth and yield of chickpea (*Cicer arietinum* L.)

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ABSTRACT

A field experiment was conducted to study the effect of seed hardening with various chemicals on morpho-physiological traits and yield in chickpea *(Cicer arietinum.* L) during *Rabi* 2007, under rain fed conditions. Significantly higher seed yield was recorded in seed hardening with $CaCl_2$ -2% (26.32q per ha) followed by Cycocel 1000ppm (23.54 q per ha) and succinic acid 20ppm (23.44 q per ha) as compared to control (19.04q per ha.). The increased seed yield in seed hardening with $CaCl_2$-2% may be attributed to increase in the morpho- physiological traits like plant height, number of leaf lets, leaf dry matter, total dry matter accumulation, leaf area per plant and harvest index.

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Key words : Seed hardening, Chickpea $CaCl_2$, Cycocel, Succinic acid

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is a major *Rabi* season pulse crop in southern peninsular India. It is generally grown on conserved moisture and moisture in the soil profile gradually recedes as the crop grows. As a consequence, plant experiences progressively increasing degree of terminal moisture stress. Thus, soil moisture stress assuming a major limiting factor for determining the growth and yield of chickpea (Verma and Pramilakumari, 1978). Therefore, there is a need to identify suitable ameliorative measures to overcome the moisture stress effect.. The pre-sowing seed hardening with chemicals is one of the simple technique being employed to modify the marpho-physio biochemical nature of seed, so as to induce the characters that are favourable for drought resistance. Keeping these views, the investigation was under taken to study the effect of seed hardening chemicals on growth and yield in chickpea.

MATERIALS AND METHODS

A field experiment was conducted during *Rabi* 2007 at college of agriculture farm VAS, Dharwad, under rain fed conditions. The trial was laid out in RBD with three replications. A day before sowing, seeds of Chickpea variety, ICCV-2 were soaked for three hours separately in water, and solution of $CaCl_2$ (1 % and 2%), KH_2PO_4-1 %, KNO_3-100ppm, KCl- 0.1 %, sodiummolybdate-100ppm, zinc sulphate-100ppm, cycocel-10000ppm, succinicacid-20ppm, ascorbic acid- 20ppm. Later seeds were dried under shade and used for sowing. The plant height was recorded from base of the plant to tip of the main stem. The leaf area per plant was computed by graphic method. Number of leaf lets, total dry matter and its distribution in leaf stem and reproductive parts were worked out from the tagged five plants and average was computed and presented on per plant basis.

RESULTS AND DISCUSSION

The data on morpho-physiological parameters of chickpea revealed, significantly higher plant height (48.1cm) in seed hardening with $CaCl_2$ 2% ,where as lower plant height in cycocel-1000ppm. This clearly indicated mode of action differed for the chemicals studied. Similarly in finger millet seed hardening with $CaCl_2$ 2% improved the plant height and was due to redistribution of resources leading to cell enlargement and cell division (Karivartharaju and Ramkrishna (1985). The mechanism of reduction in plant height in seed hardening with Cycocel l000ppm to be due to reduced cell size and cell thickening (Ginzo *et al.,* 1977).Similar results were reported by Dighe *et al.* (1983) in Wheat. Increase in TDM, leaf dry matter, stem dry matter and redistribution of dry matter in reproductive parts was noticed with seed hardening with $CaCl_2$ 2% as compare to control. In addition, more number of leaf lets and leaf area were also more with seed hardening with $CaCl_2$ 2%.Thus TDM and its partition and leaf area were important parameters to boosting the source sink relationship, which is evident from the improvement in the yield and yield parameters (Table 1).

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Table l : Influence of seed hardening chemicals on morho- physiological traits in chickpea

Treatments	Plant height (cm)	No. of leaf lets per plant at 80 DAS	Leaf area at 80 DAS (cm^2)	Leaf dry matter ($g\ plant^{-1}$)	Stem dry matter ($g\ plant^{-1}$)	Total dry matter ($g\ plant^{-1}$)
T_1 : Control	40.6	201.7	393	1.48	4.05	22.2
T_2 : Water soaking	43.5	216.0	408	1.85	4.92	26.5
T_3 : $CaCl_2$ (1%)	43.7	210.3	403	1.35	5.11	24.6
T_4 : $CaCl_2$ (2%)	48.1	298.0	492	2.16	8.14	36.1
T_5 : KNO_3 (1%)	44.7	247.7	438	1.96	5.64	30.6
T_6 : KNO_3 (100 ppm)	46.0	297.0	456	20.9	6.16	31.6
T_7 : KCl (100 ppm)	45.0	222.0	432	1.48	4.26	27.8
T_8 : Sodium molybdate (100 ppm)	43.8	231.7	405	1.98	5.04	26.0
T_9 : Zinc sulphate (100 ppm)	44.7	256.0	438	2.00	5.13	27.1
T_{10} : Cycocel (1000 ppm)	39.6	285.0	399	2.08	7.43	32.7
T_{11} : Succinic acid (20 ppm)	40.3	269.0	399	2.02	7.78	30.9
T_{12} : Ascorbic acid (20 ppm)	45.6	239.3	444	1.93	5.07	27.8
S.E. $\pm$	0.91.	8.9	12.5	0.06	0.37	1.57
C.D. (P=0.05)	2.63	25.6	36.2	0.17	0.95	4.53

Table 2 : Influence of seed hardening chemicals on yield and yield traits in chickpea

Treatments	Seed yield ($g\ plant^{-1}$)	100 seed weight (g)	Harvest index (%)	Seed yield ($q\ ha^{-1}$)
T_1 : Control	9.12	26.64	41.1	19.04
T_2 : Water soaking	11.11	28.69	42.0	19.41
T_3 : $CaCl_2$ (1%)	11.58	29.22	47.1	19.12
T_4 : $CaCl_2$ (2%)	19.15	30.77	53.1	26.32
T_5 : KNO_3 (1%)	13.48	26.66	44.0	22.02
T_6 : KNO_3 (100 ppm)	13.77	30.33	43.6	23.73
T_7 : KCl (100 ppm)	12.85	24.89	46.2	20.65
T_8 : Sodium molybdate (100 ppm)	12.63	24.52	48.6	21.71
T_9 : Zinc sulphate (100 ppm)	13.2	26.36	48.7	22.34
T_{10} : Cycocel (1000 ppm)	16.10	27.70	49.2	23.54
T_{11} : Succinic acid (20 ppm)	14.67	27.20	47.5	23.44
T_{12} : Ascorbic acid (20 ppm)	12.96	26.63	46.6	22.45
S.E. $\pm$	0.62	0.73	2.05	1.16
C.D. (P=0.05)	1.81	2.11	5.95	3.38

Significantly higher seed yield was recorded in seed hardening with $CaCl_2$ 2%(26.32q/ha) followed by Cycocel 1000ppm (23.54q/ha) and Succinic acid 20ppm (23.44q/ha) over control (Table 2). The increase in the yield in seed hardening with $CaC1_2$ 2% may attributed to increase in the yield components mainly 100 seeds weight, seed yield per plant and harvest index coupled with higher mean value of growth parameters in general. However, control recorded lower yield and lower mean value for yield components. The results are in agreement with the findings of Mishra and Dwivedi (1980), who reported that treating wheat seeds with 0.25% $CaCl_2$ or 2.5% KCl increased the grain yield compared to control. On the other hand increased drought tolerance and grain yield in sorghum over control under dry condition was reported by Patil . (1987).

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