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PHYSIOLOGICAL EEECTS OF SEED TREATMENTS WITH GA ON SEEDING GROWTH UNDER LABORATORY AND FIELD CONDITIONS IN RED GRAM

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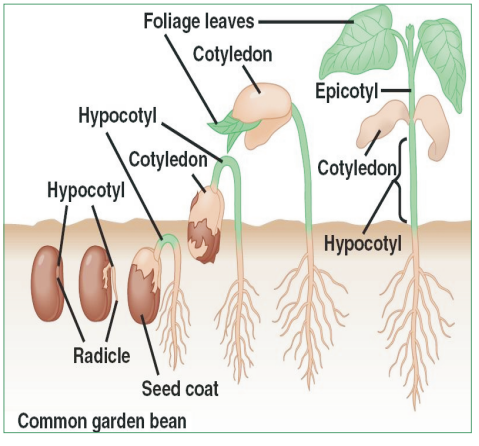
ABSTRACT

Immersion of seeds in solutions containing PGRs has been suggested by various workers to enhance seed germination and emergence potential, under adverse growing or environmental conditions, or alternatively under satisfactory conditions using seeds of impaired germinating quality.



GA are used to increase alpha amylase activity in germinating Barley seeds , which is used for malt production in beer Industry. This hormone also stimulates hydrolysis and transport of stored food material from endosperm and cotyledons to the growing Root-Shoot axis specially in the cereals.

Interest in the use of growth regulators in crop production arises from the beliefs of plant physiologists that maximum levels of plant productivity GA promote seed germination .GA has several form .GA 10-1, GA 10-2, GA 10-3.....so on . All the Gibberellins are able to promote either stem elongation or cell division although their relative effectiveness may be different.

Studied for determining effect of different concentration of GA in Red gram on percentage germination and seedling growth interms of shoot and root lengths and dry weight distribution.Under Laboratory and Field conditions.

KEYWORDS :*seed germination,seedling growth,,GA, Red gram .*

INTRODUCTION

PGRs (GA3) have been found quite effective when incorporated in partially aged seeds of soybean, with mustard and black gram and green gram (Saxena 1989). Lint index, seed index, ginning

%, boll numbers and weight of seed cotton per boll, PGR were increased in treated seeds. Pod numbers, pod weight per plant, yield of branches were higher in pretreated seeds of mustard.The number of pods per plant and 100 seed weight were higher in black gram and green gram. The cumulative effects of these treatments in increasing productivity of these crops were quite significant under field conditions (Saxena, 1989).

From the -foregoing review the impacts of seed pretreatments with GA. in improving yields in a variety of plants is apparent. PGRs are beneficial in increasing vegetative and reproductive growth under field conditions. Hence, it was thought worthwhile to investigate the effects of seed pretreatments with PGRs like GA, on the Red gram crops recommended for intensive cultivation. The results obtained are discussed below.

MATERIALS AND METHODS

The seeds of red gram (local) were studied for their physiological performance under the effect of 10-4 to 10- 7 M concentration of gibberellicacid (GA) .

The seeds were soaked in different concentrations ofPGRs for the optimum periods were 4 hrsfor red gram.Two sets of experiments were laid : (I) laboratory studies and(II) field studies.
The results reported in Tables are means of at leastthreereplications and were analyzed statistically.

I) Laboratory studies

In all these studies, uniformly selected seeds weregerminated in sterilized petridishes lined with filter paperand treated with 8 ml DW. The seeds were also treated withmercuric chloride to avoid fungal contamination as described in Chapter II. The percent germination, lengths of shoot androot were measured after 5 days. The petridisheswere kept at 28°C±20C and under normal light condition. Fresh and dry weight (mgm per organ) was recorded after drying the samples in an oven at 80°C.

(II) Field studies

Seeds of four seeds were pre-soaked for their optimumdrying period.They were then air dried to bring to theirinitial weight. The pre-soaked and dried seeds were grown inrows made in field plots (30 m^2) for 30, 60 and 90 days. Thefollowing data were collected on the plants so cultivated (1) height, (2) leaf length, (3) leaf width, (4) leaf area,(5) leaf number, (6) tiller numbers, (7) stem dry weight, (8)root dry weight, (9) total plant weight.

OBSERVATION & OBSERVATION TABLE

Table 1.Effect of presoaking red gram for 4 hours in different concentration of GA on % germination and seedling growth.

Plant Growth Regulators (Hrs)	% Germi-nation	ROOT			SHOOT			LEAF	
		LN	FW	DW	LN	FW	DW	FW	DW
GA 0	86	9.30	113	13	6.80	111	13	108	12
GA 10^{-4}	100	10.77	115	15	7.60	117	18	110	16
GA 10^{-5}	90	8.53	111	12	6.33	116	14	104	13
GA 10^{-6}	66	7.63	109	10	5.60	112	12	102	11
GA 10^{-7}	50	6.33	108	10	5.20	110	10	101	10
S.E. C.D. (P=0.05)	3.13 6.97	0.03 0.06	0.43 0.95	0.35 0.77	0.05 0.11	0.61 1.35	0.29 0.64	1.09 2.42	0.29 0.64

Table 2. Effect of presoaking of red gram for 4 hours in different concentration of GA after air drying on % germination and seedling growth.

Plant Growth Regulators (Hrs)	% Germi-nation	ROOT			SHOOT			LEAF	
		LN	FW	DW	LN	FW	DW	FW	DW
GA 0	63	6.37	109	12	10.40	113	12	111	11
GA 10^{-4}	96	7.60	113	16	15.53	119	16	115	15
GA 10^{-5}	83	7.17	113	14	11.53	117	13	112	11
GA 10^{-6}	63	7.17	111	13	10.57	114	12	110	11
GA 10^{-7}	43	6.43	110	12	10.17	111	11	108	10
S.E. C.D. (P=0.05)	2.91 6.48	0.05 0.11	0.77 1.71	0.27 0.60	0.03 0.06	0.45 1.00	0.40 0.89	0.33 0.73	0.46 1.02

Table 3. Physiological performance of seedlings from presoaked (air dried) seeds of Red gram in GA(10^{-4} to 10^{-7})under field condition at 30, 60, 90 days

Treatment	Plant Height	Leaf Length	Leaf Width	Leaf Area	Leaf No.	Tiller No.	Stem Dry wt.	Root Dry wt.	Total Plant wt.
30 days									
Control	28.70	0.43	0.30	0.08	0.00	0.00	38.00	39.67	334
10^{-4}	30.30	0.57	0.50	0.08	0.00	0.00	47.67	59.00	413
10^{-5}	29.73	0.43	0.37	0.06	0.00	0.00	44.00	56.00	338
10^{-6}	28.17	0.27	0.27	0.06	0.00	0.00	40.33	53.00	330
10^{-7}	26.33	0.20	0.20	0.05	0.00	0.00	38.00	51.67	327
S.E. C.D.	0.01 0.22	0.01 0.02	0.02 0.04	0.03 0.04	- -	-	0.36 0.80	4.59 0.22	0.38 0.84
60 days									
Control	30.57	0.40	0.30	0.07	0.00	0.00	40.33	81.00	332
10^{-4}	43.03	0.53	0.57	0.08	0.00	0.00	49.67	86.00	416
10^{-5}	41.90	0.30	0.43	0.08	0.00	0.00	46.00	72.67	332
10^{-6}	38.97	0.23	0.23	0.08	0.00	0.00	41.00	63.33	326
10^{-7}	36.53	0.20	0.20	0.08	0.00	0.00	37.00	61.67	325
S.E. C.D.	1.39 3.09	0.10 0.22	0.22 0.04	0.02 0.04	- -	- -	0.03 0.06	0.02 0.03	0.64 1.42
90 days									
Control	37.80	0.63	0.33	0.08	0.00	0.00	42.00	47.00	387
10^{-4}	58.00	0.83	0.53	0.08	0.00	0.00	58.00	67.33	598
10^{-5}	51.73	0.63	0.43	0.07	0.00	0.00	54.33	63.00	487
10^{-6}	42.17	0.47	0.27	0.06	0.00	0.00	44.33	62.67	436
10^{-7}	40.37	0.33	0.27	0.06	0.00	0.00	47.33	61.67	387
S.E. C.D.	1.07 2.38	0.63 1.40	0.25 0.55	0.01 0.02	-	- -	0.001 0.002	0.02 0.06	0.04 0.06

RESULT AND DISCUSSION

Laboratory studies on red gram

The results on red gram seeds pre-soaked (Lot A) andair-dried (Lot B) are given in Tables 3.The

percent germination in both these lots ranged from 43 to 100 and the best results were recorded as 10^{-4} PGR concentration. The root length was maximum with KIN, whereasfor shoot length the best result for pre-soaked seeds was obtained with airdried seeds with GA. On anaverage, the root length in both the lots ranged from 4.6 to11.3 cms and shoot length 5.1 to 15.5 cms with maximumlengths at 10^{-4} concentrations.

The root length and shoot length were maximum with GA respectively in air dried seeds. As far as leaf dry weight was concerned the bestresult was obtained for both pre-soaked and air dried with GA. The dry weight accumulation in 5 days in leaf wasfrom 10 to 23 mgm in both lots.

Field studies on Red gram :

Red gram gave poorest response.Whatever little response was true, it was maximum when seedswere treated with 10-4 PGR concentration. The plant heightranged from (in cms) 25.9 to 32.7 at 30 days, 30.0 and 48.1at 60 days and 36.5 to 58.0 at 90 days with the three PGRs.The leaf length, leaf width and leaf area fluctuated within narrow limit (Tables 3). No tillering of the crop wasnoticed even after 90 days. There was hardly any differencebetween PGRs so far as dry matter accumulation stem and rootwas concerned. The dry weight of root was significantlyhigher than that of stem at 30 and 60 days. However thedifference in stem and root dry weight at 90 days was verysmall with different concentration of GA(Table 3).

Thus it can be seen that the best response to PGRs was shown by red gram. It appears thatlevel of auxin increases by exogenous application of GA3 and thus poor root formation is noticed. Different behaviour ofGA3 and KIN is also reported by various workers (Carr, 1970;Laloraya, 1970;Philips, 1973; and Krishnamoorthy, 1975) that gibberellins are largely responsible for cell elongationwhile kinetin is mainly responsible for cell division. GAandKIN effects are better pronounced on the shootelongation. Laloraya (1970) has shown that application of GA results in longitudinal growth which is comparable with the dark growth while KIN effects are pronounced onthe lateral growth. Similar results are also seen in present studies .GA was largely responsible for elongation of shoot. It is the critical balancebetween exogenous and endogenous GA3 levels whichwill decide growth in one particular direction.

CONCLUSION

GA was largely responsible for elongation of shoot.GA stimulate extensive growth in intact plants . They enhance elongation of intact stems much more than that of excised stem segments

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