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Physiological effect of seed treatments with kinetin on seedling growth under laboratory and field conditions in Green 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.

Kinetin enhanced the germination ability of the seed under high temperature conditions (McCoy and Harrington, 1970) as well as under drought stress conditions (Kaufman and Ross, 1970).

Interest in the use of growth regulators in crop production arises from the beliefs of plant physiologists that maximum levels of plant productivity Kinetin promote seed germination. Kinetin has several forms .kin10-1, kin10-2, kin 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 kinetin in Wheat on percentage germination and seedling growth in terms of shoot and root lengths and dry weight distribution. Under Laboratory and Field conditions.

Keywords: seed germination, seedling growth, KIN, Green gram

1. Introduction

Germination and seedling growth are regulated by the interplay between germination and growth promoters and inhibitors. The amounts of these are changing within the germinating seeds as a result of a number of factors both external and internal. KIN was reported to stimulate the germination of lettuce seeds through sensitization of the seeds to light from the foregoing review the impacts of seed pretreatments with Kinetin. In improving yields in a variety of plants is apparent. Kinetin 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 kinetin, on the Green gram crops recommended for intensive cultivation. The results obtained are discussed below.

2. Materials and Methods

The seeds of Green gram (Kopargaon) were studied for their physiological performance under the effect of 10^{-4} to 10^{-7} M concentration of Kinetin(Kin).

The seeds were soaked in different concentrations of PGRs for the optimum period was 4 hrs for Green gram. Two sets of experiments were laid: (I) laboratory studies and (II) field studies. The results reported in Tables are means of at least three replications and were analyzed statistically.

2.1 Laboratory studies

In all these studies, uniformly selected seeds were germinated in sterilized petridishes lined with filter paper and treated with 8 ml DW. The seeds were also treated with mercuric chloride to avoid fungal contamination as described in Chapter II. The percent germination, lengths of shoot and root were measured after 5 days. The petridishes were kept at $28^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and under normal light condition. Fresh and dry weight (mgm per organ) was recorded after drying the samples in an oven at 80°C .

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2.2 Field studies

Seeds of Green gram seeds were pre-soaked for their optimum drying period. They were then air dried to bring to their initial weight. The pre-soaked and dried seeds were grown in rows made in field plots (30 m²) for 30, 60 and 90 days. The following 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

2.3 Observation & Observation Table

Table 1: Effect of presoaking Green gram for 4 hours in different concentrations of Plant growth regulators on % germination and seedling growth

Plant Growth Regulators(Hrs)	% Germination	ROOT			SHOOT			LEAF		
		LN	FW	DW	LN	FW	DW	FW	DW	
KIN										
KIN 0	53	7.8	111	12	5.1	107	11	102	13	
KIN 10 ⁻⁴	93	9.1	118	17	4.6	112	12	113	17	
KIN10 ⁻⁵	83	8.4	112	13	4.1	110	16	110	14	
KIN 10 ⁻⁶	63	5.6	110	11	3.8	108	15	108	12	
KIN10 ⁻⁷	43	4.8	106	10	3.1	110	12	107	11	
S.E.	2.13	0.11	1.24	0.59	0.04	0.43	0.45	0.46	0.58	
C.D. (P=0.05)	4.14	0.22	2.76	1.31	0.08	0.95	1.00	1.02	1.29	

Table 2: Effect of presoaking Green gram for 4 hours in different PGRs after air drying on % germination and seedling growth.

Plant Growth Regulators(Hrs)	% Germination	ROOT			SHOOT			LEAF	
		LN	FW	DW	LN	FW	DW	FW	DW
KIN0	80	7.8	108	12	13.8	106	12	109	11
KIN10-4	96	10.2	113	16	15.2	113	21	107	16
KIN 10 ⁻⁵	83	9.8	112	13	14.8	108	21	102	12
KIN 10 ⁻⁶	76	9.2	110	11	13.6	106	20	101	10
KIN 10 ⁻⁷	66	8.6	108	10	12.8	103	16	101	10
S.E.	2.76	0.08	1.09	0.41	0.12	0.37	0.57	0.45	0.61
C.D. (P=0.05)	6.14	0.17	2.42	0.91	0.26	0.16	1.26	1.00	1.35

Table 3: Physiological performance of seedlings from presoaked (air dried) seeds of Green gram in KIN (10-4 to 10-7) under field condition at 30, 60, 75 days

Treatment	Plant Height	Leaf Length	Leaf Width	Leaf Area	Leaf No.	Stem Dry wt.	Root Dry wt.	Total Plant wt.
30 days								
Control	33.80	2.10	2.07	0.08	12	34.00	41.00	100
10 ⁻⁴	47.47	4.50	2.40	0.09	13	41.67	46.33	433
10 ⁻⁵	47.03	4.27	2.17	0.09	11	34.00	41.67	360
10 ⁻⁶	45.70	3.70	1.80	0.08	11	34.00	41.67	360
10 ⁻⁷	45.10	2.27	1.07	0.08	08	36.00	39.00	362
S.E.	0.08	0.07	0.07	0.25	0.51	0.40	0.96	0.35
C.D.	0.17	0.15	0.15	0.55	1.13	0.89	2.13	0.77
60 days								
Control	57.37	2.23	2.30	0.34	11	37.00	39.33	337
10 ⁻⁴	65.53	4.97	2.70	0.30	16	46.33	58.00	408
10 ⁻⁵	63.47	4.40	2.30	0.30	12	42.00	47.00	361
10 ⁻⁶	63.13	4.10	2.00	0.27	10	38.00	43.33	341
10 ⁻⁷	61.53	3.80	1.43	0.10	10	37.33	41.00	340
S.E.	0.08	0.09	0.15	0.44	0.33	0.39	0.27	0.08
C.D.	0.17	0.20	0.33	0.98	0.73	0.84	0.60	0.17
75 days								
Control	53.80	2.50	2.60	0.09	12	40.00	81.00	358
10 ⁻⁴	66.13	5.40	3.17	0.12	17	46.33	91.67	434
10 ⁻⁵	65.70	4.87	2.80	0.12	14	46.00	88.67	380
10 ⁻⁶	65.33	4.77	2.47	0.11	12	42.33	87.33	364
10 ⁻⁷	65.13	4.10	2.03	0.11	11	38.67	86.33	356
S.E.	0.03	0.02	0.08	0.37	0.38	0.63	0.40	0.58
C.D.	0.06	0.04	0.16	0.82	0.78	1.40	0.89	1.29

4. Result and Discussion

4.1 Laboratory studies on Green gram

Table 1 summarises the results obtained on pre-soaked green gram seeds.

Percent germination declined with lower concentrations of kinetin PGR. The percent germination in all the treatments ranged from 43 to 93. The former ranged from 4.8 to 18.8, cm first and latter from 10 to 16.8 cms with the best result seen at 10-4 PGR concentration. The dry weight of roots was

maximum with shoot with KIN; the former ranged from 10 to 17 mgm and latter from 10 to 18 mgm for the 5 day old seedlings, The dry weight accumulation in the leaf was more or less the same 11 to 17 mg with KIN.

Table 2 shows the results on air dried green gram seeds. The percent germination with kinetin PGR was not significantly higher than that in pre-soaked seeds and ranged from 43 to 90. The root length was maximum (10.5 cms) with within the limits of 6.4 and 10.5 cms. The corresponding values for shoot length were 12.8 to 17.1 cms with the kinetin PGR. From 10 to 15 mgm dry matter accumulated in the root and from 10.3 to 21 mgm in shoots in 5 days in PGRs treated green gram seeds. The dry matter accumulation in leaf was from 10 to 16 mgm with kinetin PGR, the difference within the treatment being statistically insignificant even at 5% level of significance.

4.2 Field studies on Green gram

The data in Tables 3 show that stimulatory effect and the seedlings grew very fast due to the application of Kinetin up to 30 days. The plant height was significantly higher than that recorded by the application of KIN (Table 3). The plant height varied from 42.3 to 65.0 at 60 days and from 53.1 to 65.3 cms at 90 days with the kinetin PGR. The maximum leaf length reached 5.40 cms in KIN treated seedlings after 75 days. The maximum leaf width reached 3.40 with the same treatment. The leaf number for green gram was considerably higher and varied from 11 to 20 after 60 days growth. The stem and root dry weight at 30 days were maximum with kinetin respectively with the plant showing the best response at 10- 4 concentration. The stem dry weight was maximum in kinetin treated seedling at 60 and 75 days. At 60 days the root dry weight was maximum in kinetin treated seedling whereas at 75 days, it was at its peak in KIN treated plantlets (Tables 3).

5. Conclusion

KIN was effective for lateral growth. It is the critical balance between exogenous and endogenous. KIN levels which will decide growth in one particular direction.

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7. References

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