EFFECT OF ABT-4 ON SEEDLING GROWTH CHLOROPHYLL ARE SOME FREE AMINOACID CONTENT IN BUCKWHEAT (FAGOPYRUM ESCULENTUM MOENCH)

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ABSTRACT

The experiments on buckwheat (Fagopyrum esculentum Moench) with ABT-4 was carried out in Central Dept of Botany, Tribhuvan University. The seeds were treated with ABT-4; 5, 10 and 15 ppm for 8 hours and were sown in earthen-warepots. The seeds treated with 10 ppm ABT showed better results in (seedling growth, chlorophy11 contents i.e. Chla, Chlb and Total chl and total free aminoacids).

INTRODUCTION

The economy of Nepal is based largely on its agricultural products. As compared to the investments made in agriculture sector by the nation, the return is quite discouraging. An amount of Rs. 2.5 billion (Us $ 50 million) is being spent

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every year in agriculture of Nepal and average growth of all agricultural products is only 2 percent per annum (Yadav, 1994.). The plant growth regulators (both natural and synthetic) when applied then influence plant growth and development (Hartmann et al 1981).

Buckwheat is a unique traditional food crop in different parts of the world. This globally neglected pseudocereal has been used for different purposes and has many features that are distinct from other crops. It is part of the stable diet in some parts of China, Japan, Russian Republic, Ukraine Republic, Belorussia and Mountainous regions of Nepal and India and some other countries of temperate zone. Buckwheat has been neglected as it has not been as competitive as some other crops and its importance has not been clearly understood by the growers and consumers.

Recently, there has been global realization of the increasingly important role of PGRS in agriculture, better growth of crops and yield. ABT is versatile plant growth regulator recently invented in China by Prof. Wang Tao in 1981. There is a series of ABT (ABT No.: 1-5), each of which is used for specification. ABT No.1 is primarily used to induce roots in stems cuttings of hard rootting plants. ABT-2 is used for raising seedlings from the cuttings of common nursery stock of flowering bushes and shrubs. ABT-3 is chiefly used to restore the root system of nursery stock during transplantation and to promote their survival state ABT-4 is used to increase yield of agricultural crops by treating seeds or seedlings before plantation. ABT-5 is used for increasing yield of tuberous crops by treating the seeds or Seed tubers before planting. The effectiveness of all of them has been well established by research workers conducted in China, Argentina, Bangladesh, Malaysia, Nepal, Thailand,. United State of America and Vietnam.

MATERIALS AND METHODS

The seeds were provided by Buckwheat Research Project (TU/ USAID) at the Research Center for Applied Science and Technology (RECAST), Kirtipur, Kathmandu in 1992/93.

Two ecotypes of seeds were selected for the study

i) Ecotype 9192 which is indeterminate common type

ii) Ecotype 90151 which is of determinate common type

ABT-4 growth regulator was received from Prof. Wang Tao, Director, ABT R and D Centre, Chinese Academy of Forestry, Beijing. The growth regulator was in powder form of 1 gm divided into 10 small packets, each containing 0.1 gm.

Chemicals were obtained from Central Dept. of Botany, Tribhuvan university. 100mg of ABT-4 was dissolved in 50ml of 95% ethanol and the solution was made 100 ml by adding distilled water. The solution was diluted separately to 5,10 and 15ppm. The healthy seeds were selected and soaked for 8 hours and air dried seeds were immediately sown in the earthenware pots. The observation were made on chlorophyll content i.e. chl. a, chl. b, and total chl following the method of Arnon (1949) and total free aminoacid content following the method of Wiggins and williams (1955). The seedling growth was studied in the petridishes with double layered filter paper in the incubator maintained at a temperature of 30 ± 1° C, Each set of petridishes was sterilized in hot air oven. Two layers of filter paper were kept in each petridish. In each petridish 20 seeds were placed. Then control and treated solution in a volume of 20 ml was put in it. In the control set 20 ml distilled water was used.

For seedling growth radical and plumule length in cm. and fresh and dry weight in mg. was recorded in treated and controlled sets on day 3,6, and 9 after germination.

RESULT AND DISCUSSION

SEEDLING GROWTH

Radicle and plumule length, fresh and dry weight of seedling increased with 5 and 10 ppm of ABT whereas 15 ppm showed inhibitory effect (Table 1). The maximum increasement of radicle length was found after three days of germination in 10 ppm of ABT-4.i.e.28.57 percent and 48 percent for ecotype 9192 and 90151 respectively in comparison to the control. Similarly the plumule length increase 64.7 and 71.4 percent for ecotype 9192 and 90151 respectively in comparison to the control with 10 ppm of ABT after three days of germination. But at 15ppm of ABT showed inhibitory effect on of radicle length for ecotype 9192 and 90151 respectively after 3 days of germination (Appendix Table 1). Similarly plumule length was also adversely affected by 23.52 percent and 35.7 percent in comparison

to control for ecotype 9192 and 90151 respectively. The maximum increasement in fresh weight is 18.8 percent and 23.3 percent for ecotypè 9192 and 90151 respectively in comparison to the control in 10ppm of ABT-4 after three days of germination. The maximum increasement in dry weight is 15.1 percent and 18.6 percent respectively for Ecotype 9192 and 90151 in 10 ppm of ABT-4 after three days of germination. 15ppm ABT showed inhibitory effect on fresh weight of fresh weight for ecotype j9192 and 90151 is 1.9 percent and 2.6 percent respectively and that of dry weight is 9.4 percent and 11.6 percent respectively in comparison to the control (Appendix Table 2).

CHLOROPHYLL CONTENT

The chlorophyll content i.e. (ch1.a, ch1.b and total chlorophyll) was maximum in the plant treated with 10 ppm of ABT after 17 days old plants i.e. ch1.a 8.3, ch1.b 5.1 and total chlorophyll 13.4 mg/g Fr. wt for ecotype 1992 and ch1.a 8.5, ch1.b 5.3 and total chlorophyll 13.8 mg/g Fr. wt. for ecotype 90151. (Appendix Table 3).

TOTAL FREE AMINOACID

On the other hand in the case of total and free aminoacids ABT-4 showed a little or no effect (Appendix Table 4).

CONCLUSION

In the present investigation we conclude that ABT-4 is most suitable for plant growth development and finally it increased the crop yield. ABT-4 is strongly recommended for crop yield.

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Table 1 : Effect of ABT-4 on radicle and plumule length.

		Length of Plumule and Radicle in cm days After Germination					
Ecotype	Treatment	3 days		6 days		9 days	
	(ppm)	R	P	R	P	R	P
9192	0	3.5	1.7	5	4.7	6	7.7
	5	4.0	2.2	5.5	5.2	6.5	8.0
	10	4.5	2.8	6.0	5.8	7.0	8.8
	15	3.0	1.3	4.3	4.2	5.5	7.4
90151	0	2.5	1.4	4.0	4.4	5.0	7.4
	5	3.0	1.9	4.5	4.9	5.5	7.9
	10	3.7	2.4	5.0	5.4	6.0	8.4
	15	2.0	0.9	3.6	3.9	4.6	7.0

Table 2: Effect of ABT-4 on fresh and dry weight of seedlings.

		Fresh and Dry Weight of Seedling (mg) Days After Germination					
	Treatment	2 days		6 days		9 daya	
Ecotype	(ppm)	Frs.wt	Dry wt	Frs. wt	Dry. wt	Frs. wt	Dry. wt
9192	0	0.533	0.053	0.543	0.074	0.554	0.078
	5	0.583	0.057	0.593	0.078	0.604	0.082
	10	0.633	0.061	0.643	0.082	0.654	0.086
	15	0.523	0.048	0.532	0.069	0.544	0.073
90151	0	0.429	0.043	0.438	0.053	0.448	0.064
	5	0.479	0.047	0.478	0.057	0.498	0.068
	10	0.529	0.051	0.518	0.061	0.548	0.072
	15	0.418	0.038	0.427	0.048	0.436	0.058

Table: Effect of ABT-4 on Chlorophyll contents. The date are mean of 3 replicates expressed as mg/g fresh weight of leaf samples.

Ecotype	Days After grenination (Age of the plant)	Concentration of ABT-4											
		0 ppm			5 ppm			10 ppm			15 ppm		
		chl.a	chl.b	total chl	chl.a	chl.b	total chl	chl.a	chl.b	total chl	chl.a	chl.b	total chl
9192	10	6.1	3.0	10.1	7.1	3.6	11.7	7.2	4.0	12.2	5.8	2.5	9.3
	17	7.2.	4.1	12.3	8.2	4.7	13.9	8.3	5.1	14.4	6.9	3.6	11.5
	24	6.9	3.8	10.7	7.9	4.4	12.3	8.2	4.8	13.0	6.6	3.3	9.9
	31	6.6	3.5	11.1	7.6	4.1	12.7	7.9	4.7	13.6	6.3	3.0	10.3
90151	10	6.3	3.2	10.5	7.3	3.8	12.1	7.4	4.2	12.6	6.0	2.7	9.7
	17	7.4	4.3	12.7	8.4	4.9	14.3	8.5	5.3	14.8	7.1	3.8	11.9
	24	7.1	4.0	12.1	8.1	4.6	13.7	8.4	5.0	14.4	6.8	3.5	11.3
	31	6.8	3.7	11.5	7.8	4.3	13.1	8.1	4.9	14.0	6.5	3.2	10.7

Table 4: Effect of ABT-4 on total free aminoacid content
The date are mean of 3 replicates and expressed as mg/g dry weight.

Ecotype	(Days after germination)	Total Free Amino Acids mg/g dry weight of leaf Different PPM Solution of ABT-4			
		0	.5	10	15
9192	10	13.0	13.1	13.2	12.9
	17	13.2	13.3	13.4	13.1
	24	13.4	13.5	13.6	13.3
	31	13.6	13.7	13.8	13.5
90151	10	13.20	13.3	13.3	13.0
	17	13.40	13.5	13.5	13.2
	24	13.60	13.7	13.7	13.4
	31	13.80	13.9	13.9	13.6

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