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Studies of Some Triaza Heterocycles on the Germination of Green Gram (*Phaseolus aureus Roxb*) and Soya bean (*Glycine max Merril*)

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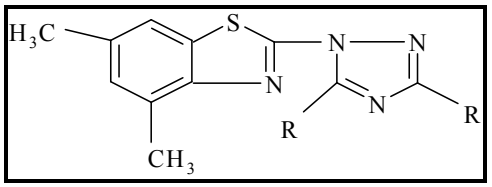
ABSTRACT

Present investigation deals with bio assaying of synthesized Benzothiazolyl triazoles compounds namely 1-(4,6-dimethylbenzothiazolyl)-3,5-alkyl. The compounds were used to find out their plant regulatory activity in the confined environment of laboratory. Experiment was undertaken to investigate their effect on germination of seeds of two plants viz. of Green gram (Phaseolus aureus Roxb) and Soya bean (Glycine max Merril).

Graphical Abstract



Heteryl 1 ,2 ,4-1H triazole.

Keywords: Benzothiazolyl triazoles, 1-(4,6-dimethylbenzothiazolyl)-3,5-alkyl/aryl, plant regulatory activity, seed germination.

INTRODUCTION

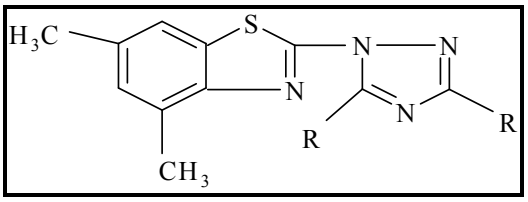
Triazoles are widely studied class of heterocyclic compounds. From the earlier reports it is found that some of the fused triazole systems are very active as plant protective agents and as plant growth stimulants. The applications are varied in nature some references are there of its applications in agricultural field. Applications of 3-amino 1,2,4-triazole are reported in the literature[**1, 2**]. Much work was carried out on the chemical nature of auxins [**3-5**]. Some derivatives of the following type Indole-3-acetaldehyde, Indole-3-pyruvic acid, Indole-3-acetonitrile, Indole-3-ethanol, indicated their close relationship to the parent structure indole aceticacid. The effect of Benzothiazolyl hydrazones and naphtha thiazolyl hydrazones on seed germination was studied for the seeds of wheat, Kakadi and Devdanger [**6**]. The compounds synthesized were evaluated for various types of bioassay screening

Green gram are selected as a representative of pulses and soybean is considered as the oil seed crop. Since these are commercial crops having much importance now a days are selected for the studies.

MATERIALS AND METHODS

Materials and Physical measurements: The chemicals and reagents used for the synthesis were obtained from commercial sources. Solvents were distilled from an appropriate drying agent. All other chemicals and solvents were of analytical grade.

Benzothiazolyl triazoles are synthesized from 2-hydrazino-4,6- dimethyl benzothiazole treating this starting material with alkyl/aryl/heteryl nitrile in presence of anhydrous aluminium chloride yielded 1-(4,6-dimethylbenzothiazolyl)-3,5-alkyl/aryl or heteryl 1,2,4-1H triazoles [7-11].



Heteryl 1,2,4-1H triazoles.

Seed Germination: Ten seeds of each plant were soaked in 50 mL of 5 ppm solutions of the compounds for 4 h. The seeds were then spread on wet filter paper in Petri dishes. The Petridishes and filter paper were sterilized before use. The filter papers were moistened with solutions of the compounds. The experiment was conducted for seven days and percentage germination, shoot length, fresh weight and dry weight were measured. Carbohydrate content was estimated by anthrone method (Yemm and Willis, 1954) at the end of fourth day. A set of control and standard (Indole acetic acid 5 ppm, Cytokinin 5 ppm and Gibberellic acid 5 ppm) was also kept for comparison. The results obtained are presented in tables 1 and 2.

RESULTS AND DISCUSSION

Effect of 1-(4, 6-dimethylbenzothiazolyl)-3,5-alkyl/arylon the germination of Green gram (*Phaseolus aureus Roxb*) : The results of table 1 indicates that percentage germination in the 1-(4,6-dimethyl-benzothiazolyl)-3, 5-di-phenyl-1,2,4-1H-triazole, and Gibberellic acid standard are 100%, the lowest is with 1-(4, 6-dimethyl- benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole and 1-(4,6-dimethyl-benzo thiazolyl)-3,5-di-4-pyridyl-1,2,4-1H-triazole. Dry weight with 1-(4,6-di methyl-benzothiazolyl)-3, 5-di-4-pyridyl-1,2,4-1H-triazole treatment is more than Gibberellic acid. Even the dry weight with 1-(4,6-dimethyl- benzothiazolyl)-3, 5-di-methyl-1,2,4-1H-triazole treatment also is good. The lowest values are with 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-phenyl-1,2,4-1H-triazole almost equal to 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole and 1(4,6-dimethyl-benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole treatment. The root length is maximum with 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-pyridyl-1,2,4-1H-triazole and next is 1-(4,6-dimethyl-benzothiazolyl) -3,5-di-4-tolyl-1,2,4-1H-triazole. Values are more with standard Gibberellic acid treatment. 1-(4,6-dimethyl-benzo- thiazolyl)-3,5-di-phenyl-1,2,4-1H- triazole and 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole treatments shoot lengths are less than Gibberellic acid and control. Conductance in all cases is less than Gibberellic acid treatment. Amongst the treatment 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-phenyl-1,2,4-1H-triazole and 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole are good but the lowest carbohydrate with 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole. In 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole treatment protein values are the highest next to it with 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-phenyl-

1,2,4-1H-triazole. The lowest is with 1-(4,6-dimethyl benzothiazolyl)-3,5-di-4-pyridyl-1,2,4-1H-triazole.

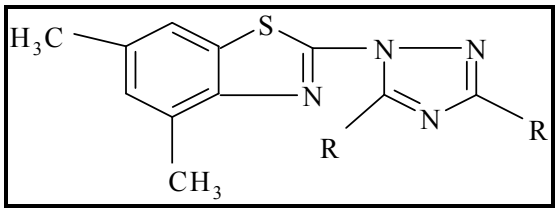


Table 1. Effect of 1-(4, 6-dimethylbenzothiazolyl)-3,5-alkyl/arylon the germination of Green gram (*Phaseolus aureus Roxb*)

S.No	Treatment R	% Germination	Fresh Wt. (gm)	Dry Wt. (gm)	Length of root (cm)	Length of shoot (cm)	pH	Conductance (mhos)	Protein (µg mL^{-1})	Carbo-hydrate (µg mL^{-1})
1	-Methyl	60	0.286	0.018	2.0	1.2	6.89	1.32	625	50
2	-Phenyl	100	0.300	0.014	2.5	1.8	6.45	0.78	750	75
3	-4-Tolyl	80	0.298	0.017	3.5	1.6	6.78	1.28	823	65
4	-4-Pyridyl	60	0.315	0.020	3.8	2.2	6.72	0.86	532	60
5	Water	100	0.215	0.013	2.2	3.0	6.83	1.2	500	63
6	Gibberellic acid	100	0.211	0.013	3.0	2.9	6.98	1.37	726	59

Effect of some 1-(4,6-dimethylbenzothon the germination of Soya bean (*Glycine max Merril*): Experiments with the compounds on soya bean seed germination, indicates that there is a 100% germination with 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole. Whereas germination with 1-(4,6-dimethyl benzothiazolyl)-3,5-diphenyl-1,2,4-1H-triazole, 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole, 1-(4, 6-di methyl-benzothiazolyl)-3,5-di-4-pyridyl-1, 2,4-1H-triazole germination is equal. Dry weight is found highest with 1-(4,6-dimethyl benzothiazolyl)-3,5-di-4-pyridyl-1,2,4-1H-triazole treatment. It is worth noting even in the results with mung gives highest dry weight. Shoot length in 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-phenyl-1,2,4-1H-triazole tops the list, whereas the least values are with 1-(4, 6-dimethyl-benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole. 1-(4,6-dimethyl-benzothiazolyl)-3, 5-di-methyl-1,2,4-1H-triazole and 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4-pyridyl-1,2,4-1H-triazole values are equal. The root length values are least with 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole and highest with phenyl. This shows that both the compounds are having the same results as far as root and shoot lengths are concerned. Conductivity indicates the values with 1-(4,6-dimethyl- benzothiazolyl)-3,5-di-4-pyridyl-1,2,4-1H-triazole are more whereas 1(4,6-dimethyl-benzothiazolyl)-3,5-di-phenyl-1,2,4-1H-triazole and 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole are equal and the lowest values are with 1-(4, 6-dimethyl-benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole. Protein values with 1-(4,6-dimethyl-benzothiazolyl)-3, 5-di-4-tolyl-1,2,4-1H-triazole treatment and methyl treatments are the same. 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole is the highest even with carbohydrate, 1-(4,6-dimethyl- benzothiazolyl)-3,5-di-4-tolyl-1,2,4-1H-triazole values are highest and 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-methyl-1,2,4-1H-triazole and 1-(4,6-dimethyl-benzothiazolyl) -3,5-di-phenyl-1,2,4-1H-triazole are equal. Lowest value is observed in 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4-pyridyl-1,2,4-1H-triazole treatment. Values with 1-(4,6-dimethyl-benzothiazolyl)-3,5-di-4- tolyl-1,2,4-1H-triazole, 1-(4, 6-dimethyl-benzothiazolyl)-3,5-di-methyl-1, 2, 4-1H-triazole and 1-(4, 6-dimethyl-benzothiazolyl)-3,5-di-phenyl-1, 2, 4-1H-triazole carbohydrate values are more even than standard Gibberellic acid treatments.

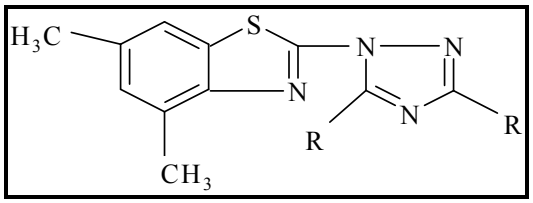


Table 2. Effect of some 1-(4,6-dimethylbenzothon the germination of Soya bean (*Glycine max Merril*)

S. No	Treatment R	% Germin-ation	Fresh Wt. (g)	Dry Wt. (g)	Length of root (cm)	Length of shoot (cm)	pH	Conduc-tance (mhos)	Protein ppm	Carbo-hydrate ppm
1.	-Methyl	100	0.598	0.025	3.5	2.0	7.03	0.87	620	164
2.	-Phenyl	80	0.600	0.032	4.0	3.5	7.05	0.98	325	158
3.	-4-Tolyl	80	0.600	0.035	2.1	1.0	6.91	1.2	652	182
4.	-4-Pyridyl	80	0.628	0.038	3.1	2.2	6.48	1.35	386	100
5.	Water	100	0.580	0.040	4.2	3.7	6.98	1.5	650	98
6.	Gibberellic acid	80	0.489	0.028	3.8	3.0	6.85	1.23	700	124

APPLICATION

Triaza compounds are used in seed germination. Hence the compounds can be used as plant growth regulators. It has been observed that the seeds under study have an increased protein and carbohydrate content which is quite useful in enhancing the nutrition capacity of these seeds.

CONCLUSIONS

The results from all the tables indicate that the compounds are showing plant regulatory activity with some of them having increased protein and carbohydrate content as compared to standards. The compounds which are effective towards Green gram are more or less showing the similar results with Soya bean.

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