KINETIN TYPE ACTIVITY OF SOME s-TRIAZOLE SYSTEMS

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Abstract — Expansion growth of cotyledon in light and dark in presence of some s-triazolo systems with condensed thiazole moiety exhibits some kinetin response. Presence of compensatory groups $-CH_3$ and $-NO_2$ helped in cotyledon expansion. Otherwise electron donating group at 3 - position is having inhibitory effect. Sulfhydryl group in triazole moiety showed photo sensitive effect. Dissociation of mercapto compound into the thianion might induce cotyledonary expansion in cucurbita.

INTRODUCTION

It was thought for some years that Kinetin alone can stimulate cell division. Later on, it was reported by Miller[1] that substitution of benzene nucleus for the furan in kinetin gives a compound more effective than kinetin. Strong[2] reported that methyl and octyl derivatives were completely inactive. It was later on shown by Kuraishi[3] that both substances had kinetin like activity and hydrazino and succinyl derivatives are without activity. Benzimidazole duplicates certain effects of kinetin. Even benzothiazolyl oxyacetic acid is equally effective as Kinetin[4]. Extensive work has been done by Laloraya[5,6,7] et al on the effect of kinetin in the expansion of cotyledons of pumpkins. This has prompted us to study the effect of s-triazole system with benzothiazole moiety as substances with the kinetin like activity. In our laboratory we have synthesized some new s-triazolobenzothiazole and s-triazolonaphthothiazole derivatives with the interest to know their chemistry and biological activity. With a view to study the kinetinic effect of these newly synthesized substances, the compounds were subjected for kinetin bioassay with 20 ppm. solution alongwith control and kinetin as standard.

Pumpkin seeds were germinated in dark at $28^{o}c \pm 2^{o}c$. Seeds were soaked in water for 5 hours. The cotyledons from three seedlings were carefully removed and were excised under green safe lamp and kept in petri-dishes (10 cm diameter) containing 15 ml of each treatment of 20 ppm dilutions.

One set of the petri-dishes was kept in dark and an identical set was kept in the fluorescent tube light. The growth measurements were made after 72 hrs of incubation. TABLE I includes the nature of the compound, expansion of cotyledons in fluorescent light and dark treatments.

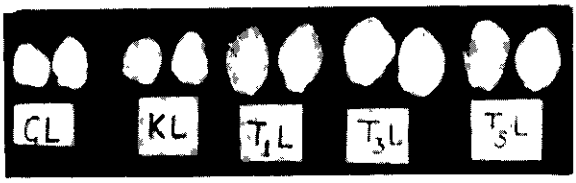
The molecular conductance of the different solutions after 24 hours of the respective treatments were determined by applying the formula

$$\mu = KV$$

where μ = molecular conductivity

V = volume in ml. which contains 1 gm mol. of solute

K = specific conductance.



CL = control, light treatment

KL = kinetin, light treatment

T_1L = 3-Mercapto-7-nitro-s-triazolo(3,4-b)benzothiazole

T_3L = 3-Mercapto-5,7-dimethyl-s-triazolo(3,4-b)benzothiazole

T_5L = 3-Mercapto-s-triazolo(5,4-b)naphtho(2,1-d)thiazole

EFFECT OF SOME FUSED s-TRIAZOLO SYSTEMS ON THE EXPANSION OF COTYLEDON

The compounds with $-NO_2$ group at 7th position having -SH, -OH at 3 position are found to be active in the light as well as dark treatment. Presence of $-CH_3$ group at 3 position behaves like kinetin.

In place of nitrobenz system if xylo system is considered, 3-mercapto-5,7-dimethyl-s-triazolo(3,4-b)benzothiazole treatment is found to be more active than kinetin. 3-Hydroxy-5,7-dimethyl-s-triazolo(3,4-b)benzothiazole shows activity nearly equal to kinetin whereas 3,5,7-trimethyl-s-triazolo(3,4-b)benzothiazole is exhibiting retardatory effect.

While, 3-substituted s-triazolo(5,4-b)naphtho(2,1-d)thiazoles (3) are considered,

which is a tetracyclic system shows the behaviour more or less identical to the xylo system. It is surprising to note that the naphtho derivatives are more active in dark compared to the 7-nitro-s-triazolo(3,4-b)benzothiazoles (1) and 5,7-dimethyl-s-triazolo(3,4-b)benzothiazole (2) systems.

TABLE: 1 THE NATURE OF THE ORGANIC COMPOUND, COTYLEDONARY EXPANSION IN LIGHT AND DARK TREATMENTS.

Sr. No.	Name of the compound	Expansion of cotyledon			
		Treatments			
		Fluorescent light		dark	
		Length cm	Width cm	Length cm	Width cm
A)	7-Nitro-s-triazolo(3,4-b)benzothiazoles				
1.	7-Nitro-s-triazolo(3,4-b)benzothiazole	1.8	1.1	1.6	1.0
2.	3-Mercapto-7-nitro-s-triazolo(3,4-b) benzothiazole	2.4	1.5	1.8	1.2
3.	3-Hydroxy-7-nitro-s-triazolo(3,4-b) benzothiazole	2.0	1.2	1.8	1.3
4.	3-Methyl-7-nitro-s-triazolo(3,4-b) benzothiazole	1.9	1.4	2.0	1.4
B)	5,7-Dimethyl-s-triazolo(3,4-b)benzothiazoles				
1.	5,7-Dimethyl-s-triazolo(3,4-b)benzothiazole	1.7	1.1	1.7	1.2
2.	3-Mercapto-5,7-Dimethyl-s-triazolo(3,4-b) benzothiazole	2.2	1.3	2.0	1.2
3.	3-Hydroxy-5,7-Dimethyl-s-triazolo(3,4-b) benzothiazole	1.8	1.1	1.9	1.3
4.	3,5,7-Trimethyl-s-triazolo(3,4-b) benzothiazole	1.6	1.1	1.5	1.1
C)	s-Triazolo(5,4-b)naphtho(2,1-d)thiazoles				
1.	s-Triazolo(5,4-b)naphtho(2,1-d)thiazole	1.8	1.2	2.0	1.3
2.	3-Mercapto-s-triazolo(5,4-b)naphtho (2,1-d)thiazole	2.0	1.4	2.1	1.3
3.	3-Hydroxy-s-triazolo(5,4-b)naphtho (2,1-d)thiazole	1.8	1.1	1.8	1.3
4.	3-Methyl-s-triazolo(5,4-b)naphtho (2,1-d)thiazole	1.6	1.1	1.7	1.2
	Control	1.7	1.2	1.8	1.2
	Kinetin	1.8	1.2	2.0	1.3

When the comparison is made between the parent compounds, unsubstituted at 3-positions, 7-nitro-s-triazolo(3,4-b)benzothiazole[8], 5,7-dimethyl-s-triazolo (3,4-b)benzothiazole[9,10], and s-triazolo(5,4-b)naphtho(2,1-d)thiazole[11], results are no way superior to kinetin. (TABLE 1). Maximum cotyledonary expansion was found in the treatment given with 3-mercapto-7-nitro-s-triazolo(3,4-b)benzothiazole. This is probably due to the presence of strong electron withdrawing $-NO_2$ group. Presence of electron donating $-CH_3$ group at 3-position in all the series show decreased cotyledonary expansion in light and dark, the result which is not in agreement with Kuraishi's[3] observation. However, $-CH_3$ at 3-position with $-NO_2$ at 7th displayed Kinetin type activity both in light and dark. This behaviour could be explained due to the presence of $-NO_2$ and $-CH_3$ group on the same system having electron withdrawing and electron donating effects. The presence of -OH at 3 position in s-triazolo systems did not show much activity except in 3-Hydroxy-7-nitro-s-triazolo(3,4-b)benzothiazole, light treatment. Amongst all the treatments 3-mercapto-7-nitro-s-triazolo(3,4-b)benzothiazole compound showed maximum expansion of cotyledons.

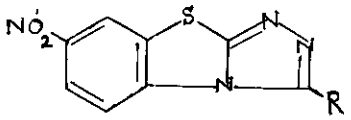
The molecular conductance of 3-SH, 3-OH and $3-CH_3$ in the three different systems were determined. It is found that the molecular conductance of 3-SH and 3-OH compound is more than kinetin, Whereas the molecular conductance of $-CH_3$ compound is less than kinetin. This indirectly reflects on the nature of the electrolyte with mercapto, hydroxy and methyl groups. (TABLE 2).

TABLE: 2 MOLECULAR CONDUCTANCE IN mhos [LIGHT TREATMENT]

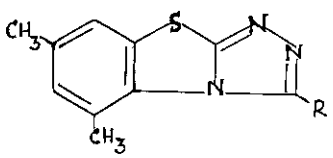
Sr. No.	Name of compound	μ = KV
1	3-Mercapto-7-nitro-s-triazolo(3,4-b)benzothiazole	959
2	3-Mercapto-5,7-dimethyl-s-triazolo(3,4-b)benzothiazole	812
3	3-Mercapto-s-triazolo(5,4-b)naphtho(2,1-d)thiazole	831
4	Kinetin	797

It can therefore be concluded from the above discussion that the cotyledonary expansion in light and dark is controlled by different substituents on condensed s-triazolo systems. The presence of compensatory groups $-NO_2$ at 7th at B_z part alongwith $-CH_3$ at 3-position on triazole moiety helped in cotyledonary expansion.

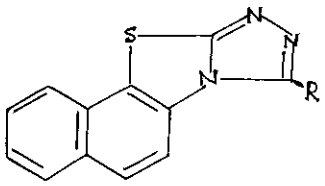
Otherwise electron donating group at 3 position is having inhibitory effect.



(1)



(2)



R = -H, -SH, -OH, $-CH_3$

(3)

The replacement of xylo system by naphthalene ring did not show any marked influence in the cotyledonary expansion, both in light and dark treatments. The presence of sulphhydryl group on triazole moiety showed photosensitive effect resulting in pronounced kinetin activity. Easy dissociation of mercapto compound into thianion might induce the cotyledonary expansion in cucurbita. Further work on these lines is in progress and the results shall be published at future date.

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