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ORIGINAL ARTICLE

Control of Early Blight of Potato Caused by Alternarea Solani Using Copper (II) Fungicides

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ABSTRACT

*Effective use of Copper (II) acetate, glycolate, chloroacetate cyanoacetate and glycinate are reported against fungicidal action of Alternaria solani causing early blight of potato (Solanum tuberosum **L.**). Copper (II) acetate and glycolate show complete inhibition of spore germination of the pathogen in all of the concentrations (25-1000 ppm). On the other hand germination by 57 to 78 per cent in the concentrations of 25 an 50 ppm. The degree of inhibition of spore germination of the pathogen decrease with the decrease in the degree of ionization of the complexes.*

***Key words**: Copper (II) Fungicides, Monosubstituted Acetates; Alternaria solani; Solanum tuberosum*

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INTRODUCTION

Number of experiments have been conducted to replace the simple salts of copper (II) by some coordination complexes of copper (II), which are less phytotoxic (Martin *et al.*, 1942). The present investigation deals with the fungicidal activity of some copper (II) monosubstituted acetates against *alternaria solani* (Ell. And martin), Jones and Grout., pathogenic to 'potato' (*Solamum tuberosum* L.) and a correlation between the toxicity of the complexes and the degree of ionization of the complexes is suggested.

MATERIALS AND METHOD

The following complexes were tested in the present study:-
(1) Cu $(CH_3COO)_2$. (2) Cu $(OHCH_2COO)_2$. (3) Cu $(ClCH_2COO)_2$. (4) Cu $(CNCH_2COO)_2$. (5) Cu $(NH_2CH_2COO)_2$.

All the complexes were synthesized by literature route (Tyagi, 1980). The purity and chemical composition of the complexes were ascertained on the basis of elemental analysis, IR, UV and magnetic susceptibility measurements (Tyagi & Srivastava, 1981).
The relative efficacy of fungicidal activity of the above mentioned compounds was investigated by spore germination method (Mc Callan, 1947). The pathogen (*Alternaria solani*) was obtained from the leaves of infected potato crop (*Solanum tuberosum* L), later purified and identified. The culture of the pathogen was maintained on P.D.A. medium and spore germination was studied from one week old culture of the same. Spore suspension was prepared in sterilized water for all complexes. For each of the complex, 7 different concentrations (25, 50, 75, 100, 200, 500 and 1000 ppm) and a control (in sterilized water) was taken. The plates were incubated at 28°C± 1°C and 100 percent relative humidity for 24hrs. For each concentration, 10 observations were taken and the mean value of these is incorporated in Table 1.

Table 1: Percentage inhibition of spore germination of the *Alternaria solani* in presence of some copper (II) monosubstitutedacetates

Complexes	Control	Concentrations of complexes in ppm							pKa of the parent carboxylic acids*
		25	50	75	100	200	500	1000	
Copper (II) acetate:									
$Cu(CH_3COO)_2$	4.1	100	100	100	100	100	100	100	4.75
Copper (II) glycolate;									
$Cu(OHCH_2COO)_2$	4.9	100	100	100	100	100	100	100	3.83
Copper (II) chloroacetate;									
$Cu(ClCH_2COO)_2$	3.7	72.7	83.4	99.6	100	100	100	100	2.86
Copper (II) cyanoacetate:									
$Cu(CNCH_2COO)_2$	6.5	42.6	54.7	84.2	100	100	100	100	2.45
Copper (II) glycinate;									
$Cu(NH_2CH_2COO)_2$	4.7	38.6	42.7	61.4	83.6	94.5	100	100	2.34

*Weast (1978)

RESULT AND DISCUSSION

From Table 1, It is obvious that spore germination of the pathogen is completely checked in all the treatments of copper.(II) Acetate and Glycolate complexes indicating there toxicity. The remaining complexes viz; copper (II) Chloroacetate cyanoacetate and glycinate are more effective at higher concentration (1000, 500, 200, 100 and 75 ppm) as the spore germination is completely inhibited in these operations; however, copper (II) glycinate, showed 78.5 per cent inhibitation of spore germination of the pathogen at the concentration of 75 ppm. The lower concentrations (50 and 25 ppm) of these complexes are found to inhibit the spore germination of the pathogen by 78-57 per cent. This varying degree of inhibitory effect of all these complexes at the concentrations of 50 and 25 ppm, comes about due to are difference in the toxicity of the complexes.

The degree of ionization of the Cu^{++} complexes depends on the extent of covalent nature of the Cu-O (carboxylate) bond. Lew and Thomson (1963) suggested that the covalent nature of the Cu-O bond is increased with a decrease in the pKa value of the parent carboxylic acids and hence the complexes are less ionic in nature. It is, there for, expected that ionic compounds bill provide more free ions which will inventorially increase the toxicity of the complexes. It is supported by all results (Table 1).

From the above results we conclude that there is lesser inhibition of spore germination of the pathogen in case of copper (II) cyanoacetate than that in copper (II) glycinate, where eas the pKa of the former compound (2.45) is lower than that of the later compound (2.34). This unexpected behavior of copper (II) cyanoacetate appears due to its polymeric structure, in which nitrogen atom of the cyano group is coordinated to the copper atom of the other dimeric unit of the complex by donating electrons of the Cu atom, consequently covalent nature of Cu-O bond increase (Tyagi & Srivastava, 1981). Therefore, the toxicity of the Copper (II) cyanoacetate is lower than that of the copper (II) glycinate.

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REFRENCES

1. Lewis J. and Thompson R.C. (1963): Magnetic properties of some aryl carboxylates of copper (II). Nature, 200, 468.
2. Mc Callan S.E.A. (1947): Bioassay of agricultural fungicides. Agric. Chem., 2(9): 31-34.
3. Martin H., Wain R.L. and Wilkinson E.H. (1942): Studies upon the copper fungicides: V. A critical examination of fungicidal value of copper compounds. Ann. Appl. Biol., 29: 412-438.

4. Tyagi A.S. (1980): Infrared studies of copper (II) substituted acetates. Ph.D. dissertation, Agra University, Agra.
5. Tyagi A.S. and Srivastava C.P. (1981): Infrared studies of copper (II) carboxylates; Influence of monosubstitution on carboxylate stretching frequencies. J. Indian chem. Soc., 58: 284-286.
6. Tyagi A.S., Srivastava C.P. and Singh S. (1981): Relative effectively of fungicidal action of some copper (II) alkanoates against Alternaria solani causal organism of early blight of potato (Soanum tubrasum L.). Proc. Indian natn. Sci. Acad. (Communicated).
7. Weast R.C. (1978): Handbook of Chemistry and Physics, 58th Edn., 150-151.