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## CERTAIN AMINO ACIDS ARE POTENT FISH-FUNGICIDES

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**ABSTRACT:** The potential fungicidal abilities of L-cysteine, L-valine, L-phenylalanine, L-methionine, L-alanine and L-isoleucine have been tested *in vitro* on five fish pathogenic watermoulds, four of Saprolegniaceae, viz., *Achlya orion* Coker & Couch, *Aphanomyces laevis* deBary, *Dictyuchus sterile* Coker, *Saprolegnia diclina* Humphrey; and one Blastocladiaceae, viz., *Allomyces arbuscula* Butler. The lowest concentration having fungicidal ability has been found to be 0.25%. Tolerance tests have also been conducted using *Colisa lalius* Hamilton and *Channa punctata* Bloch as test fishes and 0.25% has been recommended as Fungicidal Non-Toxic Concentration (FNTC) for the applicability of these amino acids as fish-fungicides.

**KEYWORDS:** Amino acids, Fish-fungicides, Watermoulds, Saprolegniaceae, Blastocladiaceae

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### INTRODUCTION

Seale<sup>1</sup> was the pioneer worker in the field of chemical control of fish mycoses, who reported the applicability of Mercurochrome in controlling fungal infection of fish. Since then, vast arrays of chemicals have been tested *in vitro* for efficacy against fish pathogenic watermoulds. During the last five decades several fish-mycopathologists have suggested two types of control measures to eliminate the pathogenic watermoulds; firstly, using different types of chemicals<sup>2-8</sup> and secondly, using biochemicals and natural products<sup>9-11</sup>. Recently, biological control of pathogenic watermoulds has successfully been attempted<sup>12</sup> using *Trichoderma viride* (a fungus) and later, a Perpetual Bioremediation System (PBS) has been developed for microbial diseases of fish<sup>13</sup>.

The present communication deals with the fungicidal properties of six amino acids, viz., L-cysteine, L-valine, L-phenylalanine, L-methionine, L-alanine and L-isoleucine; against five fish pathogenic strains of watermoulds.

### MATERIALS AND METHODS

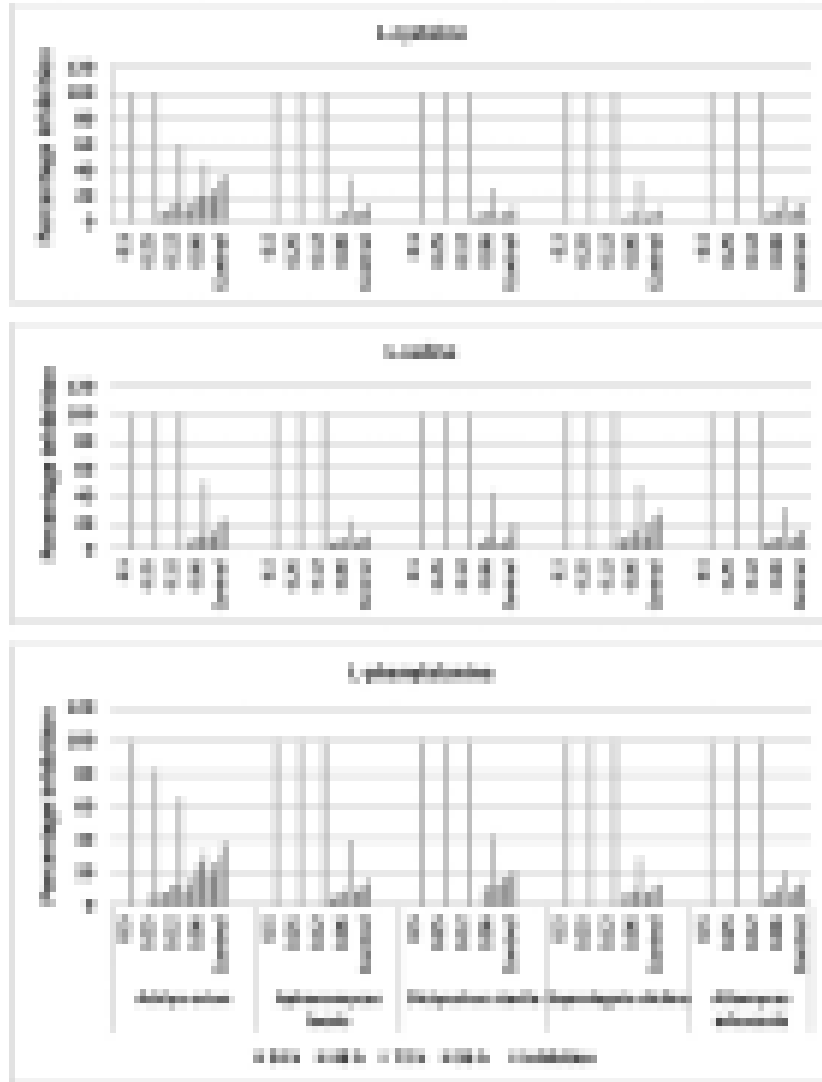
During the course of present investigation six amino acids, viz., L-cysteine, L-valine, L-phenylalanine, L-methionine, L-alanine and L-isoleucine have been tested *in vitro* for their fungicidal abilities on five fish pathogenic strains of watermoulds, viz., *Achlya orion* Coker & Couch, *Aphanomyces laevis* deBary, *Dictyuchus sterile* Coker, *Saprolegnia diclina* Humphrey and *Allomyces arbuscula* Butler. The tolerance tests were also conducted using *Colisa lalius* Hamilton and *Channa punctata* Bloch as test fishes for the toxicity. All the experiments were

performed in triplicate at 25-28°C on the lines described earlier <sup>5,14</sup>.

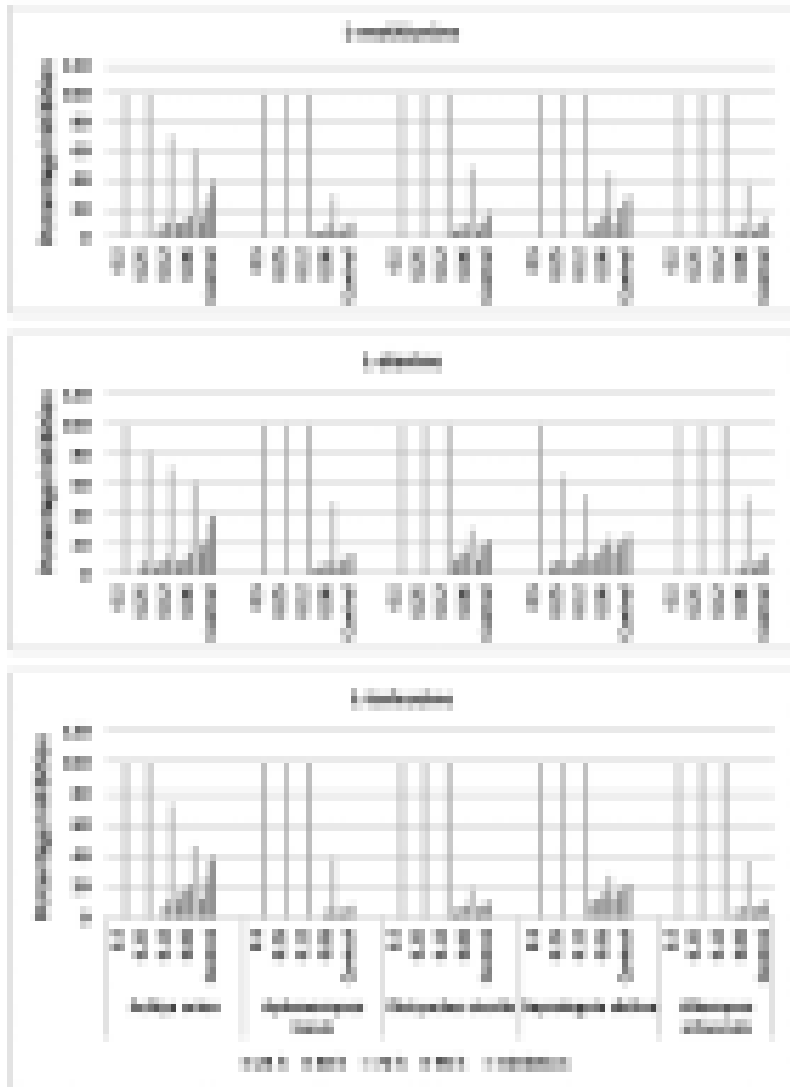
**RESULTS AND DISCUSSION**

*In vitro* studies have shown that out of

four concentrations tested, viz., 0.50, 0.25, 0.12 and 0.06% of the six amino acids; 0.25% was found to be the Lowest Effective Concentration (LEC) exhibiting 100% inhibition (Figs. 1 and 2).



**Fig. 1: Growth of fish pathogenic watermoulds (mm) in different concentrations of amino acids (L-cysteine, L-valine and L-phenylalanine) and inhibition (%).**



**Fig. 2: Growth of fish pathogenic watermoulds (mm) in different concentrations of amino acids (L-methionine, L-alanine and L-isoleucine) and inhibition (%).**

The tolerance tests conducted with L-cysteine, L-valine, L-phenylalanine, L-methionine, L-alanine and L-isoleucine on *Colisa lalius* and *Channa punctata* as test fishes (Table 1) have shown that the LEC

of these amino acids exhibiting fungicidal ability is non-toxic to both the test fishes and therefore, 0.25% concentration has been recommended as Fungicidal Non-Toxic Concentration (FNTC) for the applicability

**Table 1: Toxicity effects of certain amino acids on selected fish species.**

Name of Amino acid	Concentration (%)	Time of survival	
		<i>Colisa lalius</i>	<i>Channa punctata</i>
L-cysteine	0.50	Non-toxic	Non-toxic
	0.25	Non-toxic	Non-toxic
L-valine	0.50	Non-toxic	Non-toxic
	0.25	Non-toxic	Non-toxic
L-phenylalanine	0.50	Non-toxic	Non-toxic
	0.25	Non-toxic	Non-toxic
L-methionine	0.50	Non-toxic	Non-toxic
	0.25	Non-toxic	Non-toxic
L-alanine	0.50	Non-toxic	Non-toxic
	0.25	Non-toxic	Non-toxic
L-isoleucine	0.50	Non-toxic	Non-toxic
	0.25	Non-toxic	Non-toxic

of these amino acids as fish-fungicides.

A vast array of chemicals have been tested successfully against fish pathogenic watermoulds<sup>5</sup> having toxic residual effects on fish and, in turn, negatively affecting the consumers. However, some biochemicals and natural products have also been used for the same purpose, but, without any toxicity on fishes as well as on the consumers<sup>9,11,12</sup>. Prabhuji *et al.*<sup>10</sup>, for the first time, reported the applicability of five amino acids (L-aspartic acid, L-arginine, L-histidine, L-glutamine and L-leucine) as fish-fungicides without any toxicity.

In continuation with this work<sup>10</sup>, we have reported here the fish-fungicidal ability of six more amino acids, viz., L-cysteine, L-valine, L-phenylalanine, L-methionine, L-alanine and L-isoleucine. The aim of the present investigation has been to confirm

whether or not the amino acids exhibit a generalized characteristic feature of being the fish-fungicidal agents. The chemistry of amino acids has indicated their effective use in crop protection<sup>15</sup>. In a latest report, several naturally occurring amino acid derivatives have displayed significant activities against weeds, fungi and insects; and some of them have been even commercialized and are applied as crop protection agents<sup>16</sup>.

### CONCLUSION

The fungicidal abilities of L-cysteine, L-valine, L-phenylalanine, L-methionine, L-alanine and L-isoleucine have been tested *in vitro* on five fish pathogenic watermoulds, four of Saprolegniaceae and one of Blastocladiaceae. The lowest concentration having fungicidal ability has been found to be 0.25%. Tolerance tests conducted on

*Colisa lalius* Hamilton and *Channa punctata* Bloch as test fishes have shown that 0.25% concentration has been recommended as Fungicidal Non-Toxic Concentration (FNTC) for the applicability of these amino acids as fish-fungicides.

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