The corresponding ED_{95} value for triphenyl tin diphenyl carbazonate is 6.808 µg/ml.

P. jenseni

Table 10-12 show that diphenyl carbazone even at a concentration of 500 µg/ml has no antifungal activity after 48 hours incubation of conidial germination of P. jenseni. But bis triphenyl tin oxide is highly active and the ED_{95} value is just little over 1.25 µg/ml. The corresponding ED_{95} value for triphenyl tin diphenyl carbazonate was found to be 3.289 µg/ml.

Discussion

Examining the data obtained from conidial germination inhibition studies, the triorganotin diphenyl carbazonate has comparable fungicidal properties with corresponding bis-triphenyl tin oxide. The ED_{95} values show that the activity of triorganotin diphenyl carbazonates has been reduced some what. But it should be borne in mind that the percentage of tin in bis-triphenyl tin oxide is approximately 33% where as the percentage of tin in triphenyl tin diphenyl carbazonate is approximately 22%. Hence on basis of total tin content of the above organotins, we may conclude that triphenyl tin diphenyl carbazonate has not very reduced activity as compared to bis-triphenyltin oxide. The co-ordinating ligand diphenyl carbazone has practically no fungitoxic properties even at a concentration of 500 µg/ml. It has been reported (34) by some workers, that some intramolecularly chelated compounds

is approximately 8 times less toxic in their biologically activity. The lesser activity of such compound may be due to a reduced tendency to attack the active sites of the protein because of its internally co-ordinating nature, since the activity of tri-organotin compounds depend on the formation of co-ordinated complexes with proteins of the cell mitochondria. As the tri-phenyl tin diphenyl carbazonate is already strongly chelated entity, it might have much reduced tendency to co-ordinate with the protein sites of the mitochondria, unless rapid exchanges of ligands take place with the facile formation of triphenyl tin amino acid complexes. At the present stage of our knowledge, the idea of ligand exchange may be purely a conjecture though we cannot possibly over ride such a possibility. Alternatively, we may assume that at the dilution used for such fungitoxicity tests, triphenyl tin diphenyl carbazonate may be converted to bis-triphenyl tin oxide, which will then possibly react with proteins of cell mitochondria of the fungi. The ED_{95} values obtained for the bis-triphenyl tin oxide and triphenyl tin di-phenyl carbazonate are quite satisfactory for such a possibility. But it may be mentioned here that investigations carried out in our laboratory have shown the following ED_{95} values of certain organotins for inhibition of conidial germination of V. albo-atrum and certain other fungi.

Table -14

Compounds	ED_{95} values 9 μg/ml)
Bis-(triphenyl tin) oxalyl bis-N-ptolyl hydroxamate	3.44
Triphenyl tin dithizonate	4.20
Bis-(triphenyl tin) oxide	3.62
Tributyl tin diphenyl carbazonate	5.65
Tributyl tin acetate	6.21
Tripropyl tin diphenyl carbazonate	107.15

From the above data, we can observe that the activities of tributyl tin diphenyl carbazonate and tripropyl tin diphenyl carbazonate are widely different. If we consider that the organotin co-ordination compounds suffer hydrolysis prior to their reaction with cell mitochondria, then we would expect that tripropyl and tributyl tin diphenyl carbazonates should have at least equivalent fungitoxicities. Since the tripropyl tin compounds have equivalent if not better fungitoxic properties than tributyl

tin compounds. Moreover from the above data tributyl tin diphenyl carbazonate has better activity than tributyl tin acetate showing clearly that the co-ordination has not only reduced the activity of organotins but in fact it has enhanced the activity marginally. Considering above data, we may suggest that the marginally better fungitoxicities of organotin co-ordination compound may be due to some synergetic effect of the ligand moiety as diphenyl carbazone has practically no fungitoxic properties. Hence, under the present stage of our knowledge, we are at present not in a position to conclude any definite conclusion, whether co-ordination of ligand would definitely enhance or reduce the activity of organotins.