ABSTRACT

The bioactivity of two organochlorines and six organophosphorous insecticides were bioassayed on adult *T. confusum* in 10 types of Jamaican soils: Yallahs sand (YS), Caymanas loamy sand (CLS), Valda gravelly loamy sand (VGLS), Yallahs sandy loam (YSL), Marvelly sandy loam (MSL), Halls Delight channery loam (HDCL), Ewarton Linstead clay (ELC), Killancholly clay (KC), St. Ann clay (SAC) and Charlton Linstead clay (CLC).

The relative toxicity of insecticides varied in effect in soil types. Chlorpyrifos was the most toxic insecticide in all soil types and all insecticides were most toxic in YS. Generally, the inactivation of insecticide was more in clays > loam > sandy loam > loamy sand. However, the magnitude of inactivation varied with soil type and insecticide.

All the insecticides were generally more toxic at soil moisture levels of 12.5 to 22.5% than at the 5 to 10%, particularly in clay soils. For diazinon, the maximum differences in the LC_{50} values were 465-, 332-, 116-, 74-, 30-, 23- and 19- fold in SAC, MSL, ELC, CLS, CLC, VGLS and YSL respectively and less than 16-fold in the other soils; for chlorpyrifos, 108- and 78- fold, in ELC and SAC respectively, and less than 16-fold in the others; for diethyl bromophos, 103-, 67-, 41-, 31- and 24- fold in SAC, CLS, HDCL, CLC and VGLS respectively, and below 15-fold in the others; for chlordane, 28-, 20-, 13-, and 10- fold in SAC, CLC, VGLS and CLS, respectively and < 10-fold in the others; for dimethyl bromophos, 36-fold in ELC and < 12-fold in the others; for dieldrin, 27-fold in ELC and < 11-fold in others; for mevinphos, 20- in ELC and 1 to 5- fold in the others; and for malathion, 3 to 9- fold in all the soil types.

The toxicity of all 8 insecticides in different soils at 10% moisture level and at 12, 20, 25, 28 and 34°C revealed a positive correlation with temperature, but the degree of effect depended upon

the insecticide, soil type and temperature. Chlordane was 627-fold more effective at 34°C than 12°C in ELC, followed by MSL > YSL > VGLS > KC (100- to 57- fold), CLS > HDCL > SAC > YS (42- to 32-fold) > CLC (9-fold). The temperature effect on dieldrin toxicity was 147-fold in CLC, 92-fold in VGLS and 5 to 62-fold in the other soils.

Among the OPs, the bioefficacy of diethyl bromophos was increased the most by higher temperatures, the differences being 359- to 239-fold in ELC > SAC > KC, 60- to 42- fold in YS > CLS > MLS > YSL, 32- to 22-fold in HDCL > CLC > VGLS. Diazinon's toxicity was increased by 82.4-fold in ELC by the highest temperature but only 2 to 20- fold in the other soils. Malathion and chlorpyrifos registered only 2 to 25- fold increase in toxicity at 34°C, while mevinphos was least affected.

Cations (10, 30 or 50mM of potassium chloride, sodium chloride, calcium chloride, magnesium chloride and aluminium chloride, enhanced the toxicity of dieldrin to varying degrees in clays, sandy loam or loamy sand; maximum increases (about 5- to 7- fold) were recorded for dieldrin with Ca in SAC and Aℓ in ELC and for chlorpyrifos with Ca and Aℓ in ELC. The cations had little effect on the toxicity of diazinon.

The persistence of three doses of the eight insecticides and carbaryl (LC_{30} x 4, LC_{50} x 4 and LC_{90} x 4) on a particular soil at 10% moisture level showed dose-dependent response. The order of persistence was carbaryl > chlordane > dieldrin > organophosphorous compounds. Generally, the clays retained residues longer than the other soils.

The Lt_{50} values (days) for the highest dose (LC_{90} x 4) in YS, CLS, VGLS, YSL, MSL, HDCL, ELC, KC, SAC and CLC were 123.6, 127, 155, 196, 342, 365, 344, 207, 240 and 246 for dieldrin; 69, 105, 66, 588, 1186, 452, 307, 726, 686 and 687 for chlordane; 22, 6, 7, 5, 15, 5, 5, 18, 6 and 9 for chlorpyrifos; 7, 6, 4, 3, 12, 8, 24, 15, 9 and 22 for diazinon; 2, 3, 1, 2, 2, 3, 2, 9, 2, and 2 for mevinphos; 60, 25, 12, 101, 18, 48, 91, 58, 24 and 52 for malathion; 17, 23, 17, 25, 25, 7, 19, 15, 20 and 28 for diethyl bromophos; 19, 15, 9, 12, 34, 20, 15, 27, 16 and 29 for dimethyl bromophos; 182, 155, 700, 684, 556, 80, 413, 469, 211 and 114 for carbaryl, respectively.

Trends in the seasonal population fluctuations in the insect, mite and nematode fauna in some Jamaican soils and the effects of some insecticides were also studied.