

Online Supplementary Material

Differences among Thai agricultural worker health, working conditions and pesticide use by farm type

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Supplement Table 1. Number and percentage of pesticides reported by farm type. Percent calculated as the number of reports of pesticide group or chemical used out of total reports for type of pesticide (insecticide, herbicide, fungicide)

Pesticide type and sub group	Chemical name	Hazard classification by WHO	Rice farmers (n=44)	Flower farmers (n=77)	Vegetable farmers (n=165)	Rice & vegetable farmers (n=70)	Flower & vegetable farmers (n=68)	p-value
Insecticide								
Pyrethroid	Beta-cyfluthrin	Ib	7(13.5)	1(2.8)	17(9.3)	14(15.9)	1(2.9)	
	lambda-Cyhalothrin	II	8(15.4)	1(2.8)	14(7.7)	6(6.8)	1(2.9)	
	Cypermethrin	II	1(1.9)	-	3(1.6)	2(2.3)	-	
	Total pyrethroid reports		16(30.8)	2(5.6)	34(18.6)	22(25)	2(5.8)	<0.001
Organophosphorus	Chlorpyrifos	II	-	-	1(0.5)	2(2.3)	1(2.9)	
Carbamate	Carbaryl	II	-	-	4(2.2)	1(0.5)	1(2.9)	
	Carbosulfan	II	2(3.8)	3(8.3)	3(1.6)	1(0.5)	-	
	Carbofuran	Ib	7(13.5)	8(22.2)	27(14.8)	12(13.6)	3(8.6)	
	Total carbamate reports		9(17.3)	11(30.5)	34(18.6)	14(14.6)	4(11.5)	0.077
Bacterium	bacillus thuringensis	III	1(1.9)	1(2.8)	9(4.9)	7(8)	-	
Thiocarbamate	Cartap hydrochloride	II	6(11.5)		17(9.3)	3(3.4)	1(2.9)	
Benzoylurea	Chlorfluazuron	U	5(9.6)	4(11.1)	19(10.4)	13(14.8)	1(2.9)	
Other			15(28.8)	19(52)	68(37.2)	27(30.7)	26(74.3)	
Total insecticide use reports (%)			52(26.3%)	37(24.5%)	182(28.7%)	88(25.2%)	35(22.6%)	<0.001
Herbicide								
Pyrimidinyloxybenzoic	Bispyribac-sodium	III	13(13)	9(9.2)	12(4.0)	15(11.2)	5(5.1)	
Phenoxyacetic acid	2,4 - D sodium salt	II	28(28)	23(23.4)	64(21.4)	35(26.0)	18(18.3)	
Bipyridylum	Paraquat dichloride	II	20(20)	34(34.7)	113(37.8)	32(23.9)	37(37.8)	
Chloroacetanilide	Alachlor	II	4(4)	-	20(6.7)	4(3.0)	-	
	Butachlor	III	2(2)	-	2(0.7)	4(3)	-	
Glycine derivative	Glyphosate isopropylammonium	III	26(26)	21(37.3)	64(21.4)	31(23.1)	22(22.4)	

Pesticide type and sub group	Chemical name	Hazard classification by WHO	Rice farmers (n=44)	Flower farmers (n=77)	Vegetable farmers (n=165)	Rice & vegetable farmers (n=70)	Flower & vegetable farmers (n=68)	p-value
Anillide+Thiocarbamate	Propanil+Thiobencarb	II + II	5(5)	1(1)	3(1)	2(1.5)	2(2)	
1,3,5-triazine	Ametryn	II	-	-	1(0.3)	-	1(1)	
Aryloxyphenoxypropionate	Quizalofop-P-ethyl	II	-	1(1)	3(1)	3(2.2)	-	
Urea	Diuron	III	-	1(1.0)	-	-	-	
Other			2(2)	8(8.2)	16(5.4)	6(4.5)	13(13.3)	
Total herbicide use reports (%)			100(50.5%)	98(64.9%)	298(46.9%)	132(44.9%)	98(63.2%)	<0.001
Fungicide								
Triazole	Azoxystrobin+difenconazole	U + II	11(23.9)	-	14(9.0)	19(25.7)	1(4.5)	
	Difenoconazole	II	6(13)	8(50)	38(24.5)	14(18.9)	16(72.7)	
	Propiconazole+difenconazole	II + II	23(50)	-	25(16.1)	9(12.2)	1(4.5)	
	Total triazole reports		40(86.9)	8(50)	77(49.6)	42(56.6)	18(81.7)	<0.001
Strobilurin	Azoxystrobin	U	-	3(18.8)	21(13.5)	13(17.6)	-	
Alkylenebis (dithiocarbamate)	Mancozeb	U	1(2.2)	-	7(4.5)	2(2.7)	-	
Inorganic	Copper hydroxide	II	1(2.2)	-	6(3.9)	2(2.7)	-	
Dicarboximide	Iprodione	III	-	-	6(3.9)	-	1(4.5)	
Other			4(8.7)	5(31.2)	38(24.5)	15(20.3)	3(13.6)	
Total fungicide reports (%)			46(23.2%)	16(10.6%)	155(24.4%)	74(25.2%)	22(14.2%)	<0.001

WHO recommended classification of pesticides by hazard; Ib = Highly hazardous; II = Moderately hazardous;

III = slightly hazardous; U = Unlikely to present acute hazard in normal use

Rice Farmers: The frequency of insecticide used varied from two to four times a year (11 %) up to one to four times a week to (4%). While for herbicides they reported applying two to four times/year (23%) up to once/month (2%). Fungicide use was reported as two to four times/year (48%) up to once/month (5%) The most commonly reported insecticides used were pyrethroids (31%) and carbamates (17%). The most commonly reported herbicides were 2, 4 D sodium salts (28%) and glyphosate (26%). The most common fungicides were triazoles (87%) (Supplement Table 1)

Flower Farmers: the frequency of insecticide application varied from once/month (53.2%) to two to four times/year (40.3%). While for herbicides they reported applying two to four times/year (41.6%) up to once/month (48.1%). Fungicide use was reported as two to four times/year (22.1%) up to once/month (68.8%). The most common insecticides were carbamates (30.5%). The most common herbicides were glyphosate (37.3%) followed by paraquat (34.7%). The most common fungicides were triazoles (50%) (Supplement Table 1).

Vegetable Farmers: The frequency of using insecticide varied from two to four times a year (17.8%) to five to seven times a week (1.4%). While for herbicides they reported applying two to four times/year (26.7%) up to five to seven times a week (1%). Fungicide use was reported as two to four times/year (22.4%) up to once/month (18.4%). The most commonly reported insecticides used were pyrethroids (18.6%) and carbamates (18.6%). The most commonly reported herbicides were paraquat (37.8%) followed by 2, 4 D sodium salts and glyphosate (21.4% each). The most common fungicides were triazoles (49.6%) (Supplement table 1)

Rice/vegetable Farmers: The frequency of using insecticide varied from two to four times a year (25.8%) to five to seven times a week (3.2%). While for herbicides they reported applying two to four times/year (35.4%) up to five to seven times a week (2.4%). Fungicide use was reported as two to four times/year (24.1%) up to one to four times/week (3.4%). The types of pesticides reported were more similar to rice farmers than vegetable farmers, with a higher % of pyrethroid insecticide use reported (25%), less paraquat herbicide use reported (23.9%) and a high use of triazole fungicide use reported (75.7%)

Flowers/vegetable Farmers: The frequency of insecticide used varied from two to four times a year (39.7%) to two to four times a month (1.7%). They used herbicide two to four times a year (52.8%) to once a month (47.2%). Fungicide use was reported as two to four times/year (14%) up to once a month (86%). The pattern of pesticide use was a mixture of what was seen with single crop farmers. Overall they used less insecticides, with pyrethoid use making up 5.8% of the insecticides reported and carbamates 11.5%. They had the highest percentage of uncategorized insecticide use (74.3%). Types of insecticide used depending on types of insects destroying plants. Like vegetable farmers, the most commonly reported herbicide was paraquat (37.8%) but even more than either flower or vegetable farmers they almost exclusively used triazoles as their fungicide (81.7%) (Supplement Table 1).