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Research Article

Knowledge, Attitudes, Practices of farmers exposed to pesticides at Banikoara Township (Republic of Benin)

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Abstract

The aim of the study was to assess the knowledge, attitude and practice of the farmers related to the pesticides use in a zone of strong use in Benin.

Method: it was a descriptive and cross sectional study which focuses on adult and teenagers of both gender living in Banikoara district. By a random sampling 384 farmers were selected. The data collected have been processed and analyzed using Excel 2007 and Epi-Info Version 3.5.1. The results of the quantitative variables are presented as mean ± SD and categorical variables such as percentage. Categorical variables are compared using chi-square tests.

Results: The average age was 36.5 ± 10.6 years old. 52.1% of respondents reported that they were able to recognize their packaging without pesticides, 53.4% from their forms and 65.2% by labeled and know their meaning. Approximately 75% of the respondents reported having been trained on more than one occasion pesticides. Nevertheless, only 13.2% of respondents were storing pesticides in stores dedicated solely to pesticides. None of the respondents do not use protective mask. Literacy and membership in farmers' organization have an impact on the recognition of the labeled pesticides, knowledge of the importance of labeling, knowledge of the meaning of the symbols, storage in a single pesticide store. But they are not for storage in the bedroom.

Conclusion: Management of toxic risk relating to pesticides handling in our study area is dependent on human factors: in terms of risk awareness and good storage practices and handling.

Keywords: Pesticides; Poisoning; KAP study; Benin

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Introduction

Intensive agricultural practices in Benin since the fifties have led to a widespread use of organic pesticides[1]. Unfortunately, the use of pesticide is not without consequences for human health and the ecosystems[2]. According to the World Health Organization (WHO), "Every year, there are reportedly 1.5 million cases of pesticide poisoning resulting in the deaths of thousands of farmers and children in Africa. Although African countries import less than 10% of pesticides used in the world, it is reported that this import accounts for half of accidental poisonings and over 75% of fatal cases"[3]. Between May and September 1999, 73 cases of severe poisoning were reported in Benin by Callisulfan (Endosulfan 350g) including 37 deaths in the department of Borgou in Benin[4]. Badarou S. Coppieters registered between May 2007 and July 2008, 105 cases of poisoning among which 9 deaths were due to the Endosulfan[5]. Our country is still at record levels of harmful effects of these products on human health and the environment. The reasons for this situation may be linked to human factors (knowledge, attitudes and practices) that could be very crucial in the management of toxic risk associated with the handling and use of pesticides in Benin. Although several previous studies have already addressed the issue of the impact of pesticides on human health and the risks of eco-systemic pollution in Benin, the effectiveness of the current risks management systems (i.e., its strengths and weaknesses), has not been sufficiently addressed. The sustainability of farming which heavily depends on the use of pesticides, as well as its economic advantages can never be achieved unless the ecosystems and the health of workers are preserved. If it won't be a question of banishing pesticides, it will however be necessary to find a just balance between the necessity of their uses and the imperatives of health prevention and environmental protection.

The objective of this study is to:

1. Identify pesticides used in the area covered by the study.
2. Appreciate the knowledge, attitudes, and practices regarding the use of pesticides by farmers and the management of the empties containers.

Methods

This is a descriptive observational, exploratory and cross sectional study which focusses on adult and teenagers of both gender of the Banikoara district. This target population practice agricultural activity involving intensive use of pesticides. Banikoara is the biggest cotton production city in Benin. Producers, rural development and health workers involved in pesticide risks have been taken into account in the sampled population.

Sample size: With a prevalence of 0.5, a precision of 0.5% and error risk of 5%, the sample size was determined using the Schwartz formula, and n = 384 was subjects. To compensate for the refusal or resignations "n" was weighted by t = 1.10 s = 422 surveyed persons in total.

Sampling: We conducted a random sampling of farmers, health workers and rural development agents. Farmers were involved in the study in a probabilistic way using a simple random sampling. Others involved in the pesticides risk management, such as health workers and rural development agents were systematically taken into account in the study.

Data Collection: The previously trained to administer the questionnaire and the use of the interview guide investigators participated in the data collection. Data on producers were collected using questionnaires with individual interviews. The rural development officers and health workers have been individual interviews with service guides. Counting cards have collected the records of care, clinical information and statistics from health facilities.

Data analysis: The data collected have been processed and analyzed using Excel 2007 and Epi-Info Version 3.5.1 software. The results of the quantitative variables were presented as mean ± standard deviation and categorical variables such as percentage form. The strength of association was appreciated by OR with his CI. Categorical variables were compared using Chi-2 tests Mantel-Haenszel. The significance level chosen for all statistical analyzes was 0.05.

Results

Distribution of population depending on age, gender and level of education

The average age was 36.5 ± 10.6 years old. The highest age ranges from 15 and 70 years. Men outnumber women with a sex ratio of 18.22. The majority of respondents are illiterate (80.3%) as indicated.

Table 1: Distribution of population depending on age, gender and level of education

Items	Number	%
Ages brackets		
15-18	4	0.9
18-50	370	87.5
50-70	49	11.6
Gender		
Female	22	5.2
Male	401	94.8
Instruction		
Yes	83	19.7
No	339	80.3

Pesticides used during the study period (active ingredients, WHO classification)

Insecticides and herbicides are among the most used pesticides identified

Table 2: Pesticides used during the study period (active ingredients, WHO classification)

No.	Trade name	Active ingredient (ICD)	Toxicity WHO
INSECTICIDES			
1*	Proclaim	TEFLUBENZURON	
2*	Cutter	EMAMECTINE 48EC+ACETAMIPRID 64EC	
3	Emacot	EMAMECTINE	
4	Protet	EMAMECTINE	
5	Caïman	EMAMECTINE	
6	Fanga	PROFENOFOS	II
7	Calfos	PROFENOFOS	II
8	Profenet	PROFENOFOS	II
9	Tenor	PROFENOFOS	II
10	Calife	PROFENOFOS	II
11	Ema super	EMAMECTINE 24EC+ACETAMIPRID 32EC	
12	Stewar	INDOXACARB	
13	Cobra	SPINETORAME+ACETAMIPRID	
14	Nurelle d	CYPERMETHRINE+CHLOREPYRIPHOS	
15	Cotalmp	LAMBDACYHALOTHRINE+PROFENOFOS	II
16*	Kd plus	LAMBDACYHALOTHRINE+CHLOREPYRIPHOS	II
17*	Acetastar	BIVENTHRINE+ACETAMIPRID	II
18*	Acetastar	BIVENTHRINE+ACETAMIPRID	II
19	Chemaprid	CYPERMETHRINE+ACETAMIPRID	II
20	Conquest	CYPERMETHRINE+ACETAMIPRID	II
21	Capt	CYPERMETHRINE+ACETAMIPRID	II
22	Phoenix	CYPERMETHRINE+ACETAMIPRID	II
23**	Koptimal	LAMBDACIALOTHRINE+ACETAMIPRID	II
24**	Koptimal	LAMBDACIALOTHRINE+ACETAMIPRID	II
25**	Koptimal	LAMBDACIALOTHRINE+ACETAMIPRID	II
26**	Lamprid	LAMBDACIALOTHRINE+ACETAMIPRID	II
27**	Sting	CYPERMETHRINE+ DIMETOATE	
28	Thian		
29	Thunder		
30	Sherphos		
HERBICIDES			
31	Garil	Triclopyr+propanil	
32	Calif (cotton)		
33	Kalach (total)		
34	Lagon (maize)		

*Pesticides of which, the trade names are not found in the national authorized pesticides but whose active ingredients are covered in part or entirely under other trade names.

**Pesticides among which neither the trade names nor the associations of the active ingredient such as presented are not found in the official list of authorized pesticides.

Knowledge, attitudes and practices of the producers regarding the pesticides pictogram or label and the reason of use

52.1% of respondents reported that they were able to recognize their packaging without pesticides, 53.4% from their forms and 65.2% by labeled and know their meaning. Furthermore, 87.5% of respondents were aware of the risks against 71.2% and 68.1% respectively for the risks to the air and water.

Table 3: Knowledge, attitudes and practices of the producers regarding the pesticides pictogram or label and the reason of use

Items	Number	%
Recognizing pesticides without package		
Yes	220	52.1
No	202	47.9
Recognizing pesticides with package but by:		
Odor	218	51.5
Color	5	1.2
Recognizing pesticides with packages but by :		
Form of the package	226	53.4
Labels on the package	276	65.2
Knowledge of the significance of images on the labels :		
Yes	275	65.2
No	147	34.8
Awareness of intoxication cases		
Yes	394	93.8
No	26	6.2
Awareness of the level of toxicity according to the source of supply :		
Official plus toxicity	3	0.7
Informal plus toxic	252	59.6
Same toxicity	165	39.0
Reasons given to justify the use of pesticides in spite of their toxicity:		
Improve crop yield	317	74.9
Facilitate work	317	74.9
Fighting crop parasites	355	83.9

Knowledge, attitudes and practices of the producers concerning the pesticides storage, management of empty package and precaution of use

Only 13.2 % of the investigated stored pesticides in stores dedicated only to pesticides. The majority of respondents reused empty containers. 69.3% investigated are asserted that they took no precaution regarding protection before treating pesticides. None of the investigated uses a protective mask .

Table 4: Knowledge, attitudes and practices of the producers regarding the pesticides storage, management of empty package and precaution of use

Variables	Number	%
Storage place of pesticides		
Home	24	5.7
Bedroom	209	49.4
Kitchen	5	1.2
Common warehouse	161	38.1
Only in pesticides storeroom	56	13.2
Farms	20	4.7
Management of empty packages		
Re-use	375	88.7
Sell	230	54.4
Throw away	175	41.4
Bury	7	1.7
Burn	7	1.7
Caution of use		
Nothing at all	293	69.3
Bibs	72	17
Hide nose	118	29.9
Mask	00	00
Face protection equipment	16	3.8
Protective clothing	16	3.8
Gloves	52	12.3
Boots	21	5
Eyes glasses	11	2.6

Distribution of respondents depending on the training they received and training organizations

Handling and spraying techniques were most taught 93.3%. The behavior one should have in case of acute intoxication (43.5%) and management of waste and empty containers (42.1%) followed respectively. Approximately, ¾th of the respondents reported having been trained on more than one occasion pesticides. Health agents had intervened in the trainings only for less than 1% investigated.

Table 5: Distribution of respondents depending on the training they received and training organizations

Items	Total (Number)	%
Training Themes		
Identification of pesticides	85	20,1
Dangerousness of pesticides	79	18,7
Management of empty packages and the residues of pesticides	178	42,1
Behavior to have in case of acute intoxication	184	43,5
Handling and spraying techniques	416	98,3
Reporting information on acute intoxication	23	5,4
Number of training received		
One training session	110	26
More than one training session	308	72,8
Organizations having trained /informed		
Health agents	2	0,5
Rural development agents	408	96,5
Fertilizers distribution	65	15,4
NGOs	2	0,5
The Media	38	9

Risk factors of poisoning: knowledge and practice versus/ education, membership to farmers organizations, risks on human being.

The instruction and membership in farmers' organization have an impact on the recognition of the labeled pesticides, knowledge of the importance of labeling, of the meaning of the pictogram, of the storage in a single pesticide store. But they are not for storage in the bedroom.

All the same, awareness of the risks for humans had no influence on the storage in a specific pesticides warehouse.

Table 6: Risk factors of poisoning: knowledge and practice versus/education, membership to farmers organizations, risks on human being.

Items		OR (IC 95%)	P
Education : yes Vs No	Knowledge by labels: Yes	9,1389 [3,87 ; 21,56]	<0,05
	Knowledge of label importance: Yes	22,12 [5,34 ; 91,6]	<0,05
	Knowledge of pictogram meaning: Yes	19,79 [6,12 ; 63,94]	<0,05
	Storage in specific store: Yes	68,3 [28 ,7 ; 162,6]	<0,05
	Storage in room: Yes	0,25 [0,14 ; 0,43]	<0,05
Membership to farmers organizations : Yes Vs No	Knowledge by labels: Yes	27,76 [6,7 ; 114,9]	<0,05
	Knowledge of label importance: Yes	41,73 [5,73 ; 30,39]	<0,05
	Knowledge of pictogram meaning: Yes	27 [6,74 ; 115,54]	<0,05
	Storage in specific stores : Yes	97,6 [38,49 ; 247,56]	<0,05
	Storage in room : Yes	0,16 [0,09 ; 0,30]	<0,05
Knowledge of risks for human yes Vs No	Storage in specific warehouse: Yes	0,52 [0,25 ; 1,10]	>0,05

Signs of intoxication:

The most mentioned were skins irritation by 87.5% of respondents, eye irritation by 51.5%, and loss of appetite by 51.3%. 93.8% of the interviewed had experienced or heard of at least one case of acute pesticide poisoning. 59.6% of respondents thought that pesticides purchased in the black markets pesticides were more toxic than those purchased through official channels.

Discussion

The population interviewed in the study was young; the average age which is 36.5years (±10.6) was similar to the one found in 2012 by Passiani which was 37.7 years (±12.5) in Brazil[6], but a little higher to the one found in Thailand in a Knowledge, attitudes and practices survey, on female workers which was 26.0 years (±6.8)[7]. This difference may be due to the fact that the Thailandese study only targeted pregnant women. More than half or 54.6% of the surveyed people in this study were aged between 21 and 40 years, whereas 87.5% of the surveyed in our study said they were aged between 18 and 50 years. Almost all the surveyed people were men. Yet, this male trend was also found in the study of Passiani 99.1% and by other studies carried out by Brazilian authors[8-10]. But in their case these results would confirm the profile of Brazilian rural population. A Chinese study on population has found an opposite trend in which women outnumber men[11].

The proportion of illiterate population in our study is much higher than the one found by some authors who reported only 6.3% illiterates in their studies[6]. In the United States more than half pesticides users had at least 12 years schooling and for the same proportions had primary level education in Greece[12,13]. We believe that illiteracy could be a major handicap in identifying pesticides that contain, in addition to pictograms, written instructions in foreign languages.

We didn't noted pesticide of the class I (IA: extremely dangerous and IB: very dangerous). Almost all the pesticides noticed are of class II (moderately dangerous) which was not the case in Brasilia where 46.5% pesticides registered were of class I. Yet, it should be pointed out that, the dimethoate which is on our list has shown toxicity. That is the reason why it is no more used in some countries[14]. Chlopyrifos is reported to account for 31% of intoxication cases in Brazil[6].

The organophosphates pesticides were rated first among the pesticides with 63% that cause intoxication, according to Turkish work which states that 94% of intoxications cases are due to pesticides[15]. A Japanese study concluded that organophosphates pesticides causes serious toxicity during acute and chronic exposures[16]. All the same, in the United States, organophosphates pesticides were no longer used in order to protect the population health[17].

Identification of pesticides by their labels remains the only means of truly recognizing a pesticide. People should also be to recognize the level of toxicity and human and environmental risks as well as the usage method and precautions. The proportion of the surveyed that were aware of pictograms significance is almost the same as the one found by Passiani (68.8%) in his study[6]. The same study reports 77.7% favorable opinions on the facts that pesticides were bad for health. The proportion reported is lower than that of our study. As for air and Water pollution risks, the proportions found are almost the same. Unawareness of the potential toxicity of pesticides purchased at black market represent half of the surveyed could contribute to buying on this market and be an obstacle to mastering the quality of the products circulating in the area. The fight against parasites as the reason of pursuing the usage of pesticides is equally mentioned by 90% producers in Brasilia[18]. We notice bad good behaviors the opposite of what Passiani reported 80% surveyed had at disposal a special room for pesticides storage whereas only 4.5% who stored them in their rooms[6]. In Au Sri Lanka 33% households surveyed stored pesticides in their houses. The Storage of shows a total unawareness of the danger pesticides represent and the risks we are exposed to. This availability of pesticides in houses played a great part in the appearance of impulsive acts of autolyse according to a study in Sri Lanka[19,20]. The reutilization and sale are the most evoked destinations for the most packages in our study. In Mali it's incineration that comes first with 62%[21], in Senegal it's abandonment in the farms for 70% surveyed[21]. In all cases as well as in our study none of the surveyed people returned the packages to distribution centers or to specialized offices for their secured management[22]. This behavior is not reported by Passiani which indicates that 82% of his surveyed people declared that they returned the empty packages[6]. Furthermore, he indicates in the same study that empty packages were found on the farms of those who had declared to have returned them to the collection posts; actually 54.4% had stored the empty packages in their houses, in some areas and at last 34.8% had burnt or buried them in the fields[6]. The absence of current precautions found mostly with our surveyed is in higher proportions in Senegal 95%, in Ethiopia 76.3%[23,24]. But similar data to ours are reported in Spain 65% and in Thailand 64.4% [25,26].

Literacy and membership to a peasant association were key factors that favored the level of awareness and adoption of good practices. The stake of literacy project is to prepare the younger generation of cotton producers to meet the challenge of professionalization of agriculture. That would lead to the creation of professionalized farmers organizations which would be self dependent and less vulnerable to the influence of capitalistic oligarchy, as is the case now. However, the Brazilian study did not emphasize on literacy and storage of pesticides in specific warehouse[6]. Like in our study, Konradsen, et al found no link between risk awareness for human health and good storage practices in warehouses dedicated exclusively to pesticides[20].

Conclusion

The Knowledge, Attitude and Pratice study has shown that although most farmers were aware that pesticides can harm their health, many still have bad behaviors on pesticide handling and management of the empty containers.

Risk factors assessment of pesticides relating to pesticides handling in our study area is dependent on human factors: in terms of risk awareness and good storage practices and handling. Production activities which involve the use of pesticides are not enough organized to offer a frame of training and educational of the various actors. Illiteracy is a major handicap to understanding safety instructions. As a result, we noted practice at risk regarding storage, regarding precaution of use and management of empty containers.

The existence of informal markets for provision of pesticides does not guarantee the toxicological quality of the products used.

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