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Pesticides Use on Vegetable Crops along the Tabalak Pond in Niger

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Abstract: The rural town of Tabalak is an area where market gardening is frequently confronted with pest attacks such as red spider mites, white flies, tome worms, *Tuta absoluta*, weeds and nematodes, which contribute significantly to reducing the risk of disease. Performance. In order to find solutions to all these problems, market gardeners in this area use a variety of pesticides. During this work, the diversity of pesticides is addressed. The general objective is to have a general idea of the pesticides used by market gardeners in the Tabalak pond. To achieve this objective, exploratory talks with all stakeholders (producers, pesticide vendors, CDA etc) were carried out. The results found show, in total, sixteen (16) synthetic pesticides have been identified. Of the total pesticides, only seven are registered by the Sahelian Pesticide Committee and only two pesticides (Capt 88 EC, ACARUIS 18 EC) have not expired. These results are a good indicator for technical services in decision-making.
Keywords: Pesticide diversity, Sahelian zone, Tabalak, Sahelian Pesticides Committee.

INTRODUCTION

The vegetable are very important crops for human consumption and significantly contribute to family incomes in West Africa [1]. They are part of the most productive agricultural systems in Africa [1] where it appears to be one of the main components of urban and peri-urban agriculture [2, 3]. The vegetable crops play a vital role in most nutrition programs, the fight against poverty and contribute significantly to the family income [1].

Pest pressure was identified as the major constraint because of crop losses they cause on the production [4, 5]. Thus, farmer, automatically use pesticides to minimize these losses [4, 5]. But the use of these synthetic molecules may cause health problems such as cancer, nerve damage, infertility and malformations, etc. Inadequate control of imports, poor conditions of storage of certain pesticides becoming obsolete cause significant environmental injury, particularly in rural areas. During their process of decomposition, pesticides form byproducts that can be even more toxic than the original substance. Faced with this situation, the knowledge of the pesticides used by the farmer of each vegetable site is essential. The aim of this study was to do an inventory of pesticides used in Tabalak vegetable site, in oder to get more information on the diversity of pesticides used in this part of Niger republic.

MATERIALS AND METHODS

Study site

This study was carried out in the Tabalak vegetable producing site, where the producers grow many crops during the dry season under irrigation. The pond covers an area of 1000 ha (10 km in length and a width varying between 100 and 1000 m. The average depth is approximatively two meters but could reach six meters in some places [6]. The pond is fed during the rainy season (June-September) by runoff from a large catchment area of about 142,000 hectares (Figure 1) and drained by five koris. At the end of the rainy season, in September, the ponds become a single filiform reservoir. However, at the end of the dry season in April-May, the ittends to be subdivided into three separate reservoirs due to the natural drying up of the water and the silting process. The topography of the basin is characterized by highlands, shallows and sand dunes [7]. The climate of the zone is of Sahelo-Saharan type with a mean temperature, between 20°C and 34° Rainfall is characterized by its irregularity and poor distribution of rains in time and space.

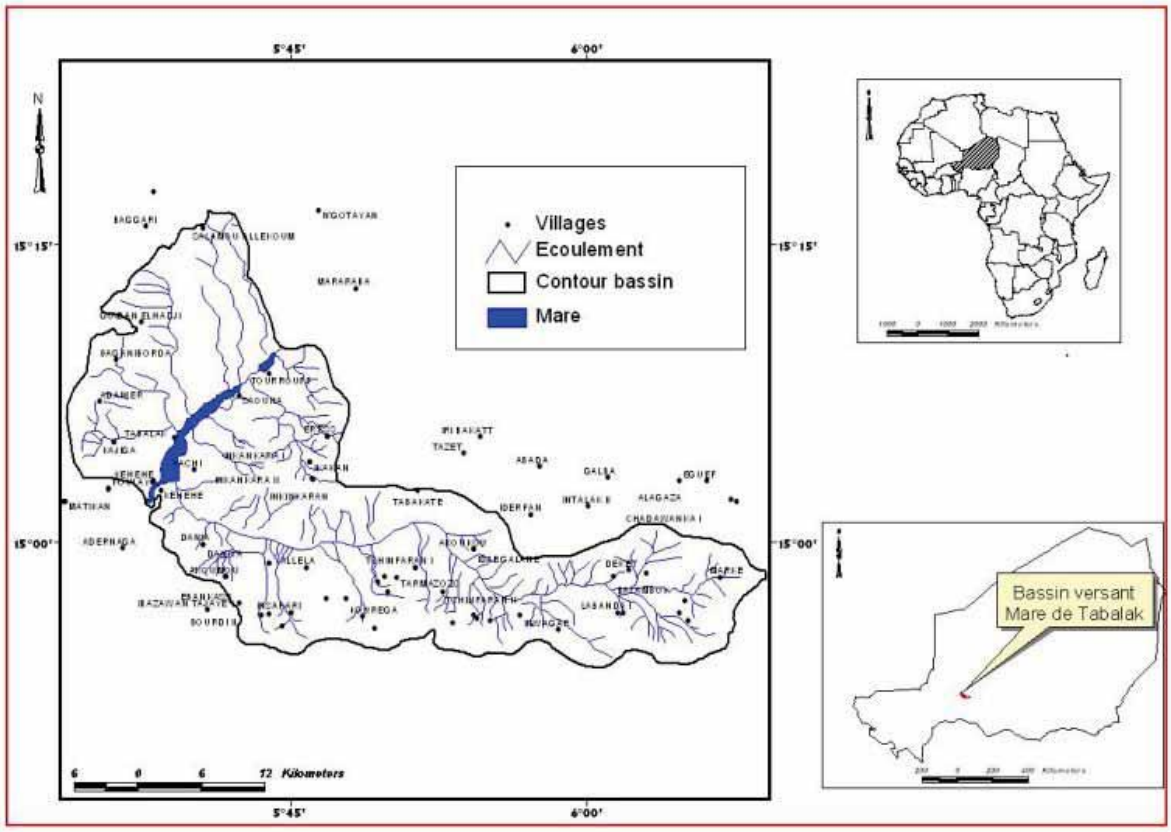

Fig-1: Location of Tabalak pond

Interview Guide

A questionnaire was addressed individually to vegetable producers. It consisted of open questions about the different types of pesticides used, their origin, the application, the trade marks, etc. Other information such as the active ingredient of each pesticide and the place collection (local pesticide sellerin the town of Tabalak and its surroundings (City of Tahoua).

Sampling method

In this study, consistent sampling was performed. It consisted of targeting producers with at least two plots in the pond. A total of 100 producers were reasonably selected. These farmers come from the different surrounding villages and those from all vegetable producing sites of Tabalak. Thus, 40 producers were targeted in Tabalak, 30 in Tsaouna and 30 producers in Kéhéhé. The table below shows the number of producers surveyed (All Sex) for each surrounding village.

Table-1: Targeted producers sampled by villages (all sexes combined)

Villages	Producers surveyed
Tabalak	40
Tsaouna	30
Kéhéhé	30
Total	100

DATA PROCESSING AND ANALYSIS

The first step was to compute collected data from each surveyed farmer in an Excel version 2017 sheet. Then they were subsequently cleaned and submitted for analysis under statview.rar, version. For qualitative data, the frequency of each person was determined. For quantitative data, the means was calculated. After all these processes, the various pesticides identified were compared to the list of authorized pesticides in the CILSS countries, including Niger (CSP: Sahelian Pesticides Committee). This comparison allowed identification of both authorized and unauthorized pesticides.

RESULTS

Diversity of pesticides

Table 2 presents the different pesticides identified during the survey. A total of sixteen (16) pesticides were found alongthe pond of Tabalak. Insecticides dominate the list with 9 products followed by herbicides represented by five (5) products. The groups of fungicides and acaricides are both represented

by only one product. Insecticides are the most widely known and commonly used. Thus, 92%, 65%, 62%, and 51% of the surveyed producers claimed to have used respectively Lambda Super 2.5EC, Rambo Power, Sharp Shooter and Perfect Killer etc; In the cas of herbicides, 28% and 26% of farmers claim to have used and Touch-off etc (Table 2).

Table-2: list of registered pesticides, frequency of user producer responses

Trade name	Active ingrédients	Local name	Frequency of use by farmers
Insecticide			
Lambda super 2.5EC	Lambda-cyhalothrin	Gamalé	92%
Sharp shooté	Profenofos (40%+cyperméthrine 4%	Mai tsoutsa	62%
Rambo Power	Permethrin 0.60%)	May Jankay	65%
Capt 88 EC	Cyperméthrine (72g/l+Acetamipride 16gr/l)	Gamalè	8%
Titan 25 EC	Acetamipride (25g/l)	Gamalé	25%
Karaté	Lambda-cyhalothrin	Gamalé	30%
Perfect Killer	Chlorpyriphos 20%	Mai Doutsi	51%
Cotofan	Lambda-cyhalothrin		10%
Pacha 25 EC	Lambda-cyhalothrin 16g/l+ Acetamipride (10g/l)	Gamalé	5%
Herbicide			
Glystar	Glyphosate	Maganin Tchiyawa	14%
Penthalin	Pendimthalin (330g/l)	Maganin Tchiyawa	18%
Touch-off	Glyphosate	Maganin Tchiyawa	26%
Pendant	Pendimthalin (33%)	Maganin Tchiyawa	28%
Acepronet 400 EC	Acetochlor+prometryne (400g/l)	Maganin Tchiyawa	14%
Fungicide			
CALTHIOC 50 WS	Thirame (25%+Chlorpyrifos-ethyl 25%)	Pazo	19%
Insecticide_Acaricide			
ACARUIS 18 EC	Abamectine	Maganin lallafa	36%

Registered pesticides found

By comparing the found pesticides with the list of the Sahelian Pesticides Committee, only seven products are approved by the CSP (Table 3). The analysis of Table 3 content reveals that nearly 71% of the pesticides used by producers have expired either since 2016 or 2017. Only two products are not expired. These are Capt 88 EC expiring in November 2020 and ACARUIS 18 EC which will expire in June 2018.

Pesticides with the same active ingredient and their area of use

By comparing the pesticides identified with the lists of the Sahelian Pesticides Committee (CSP) and the National Network of Chambers of Agriculture of Niger (RECA), several products have the same active ingredient (Table 3). Thus, Lambda-cyhalothrin is present in four insecticides (Lambda super 2.5EC, Karate, Cotofan, PACHA 25 EC) used by the producers, Acetamipride is present in three products identified (Capt 88 EC, Titan 25 EC, PACHA 25 EC) and Cypermethrin in two products (Sharp shooter, Capt 88 EC). in the cas of herbicides, Glystar and Touch-off have both Glyphosate as active ingredient. Pendimthalin is present in two herbicides: Penthalin and Pendant.

Table-3: List of Pesticide-Approved Pesticides, Active Ingredients, Expiry Date and Area of Use of Identified Pesticides

Trade name	Matter active	Expiry date according to CSP	Area of use according to CSP
Insecticides approved by CSP			
Capt 88 EC	Cyperméthrine72g/l+Acetamipride 16gr/l	Expire in November 2020	Insecticide authorized on beans but also against caterpillars, white flies etc.
Titan 25 EC	Acetamipride 25g/l	Expired in 2017	Insecticide against biting and sucking insects of market gardening crops
Rambo Power	Permethrin (0.60%)	Expired in November 2017	Insecticide allowed domestic against authorized against cockroaches and ants.
PACHA 25 EC	Lambda-cyhalothrin (16g/l + Acetamipride 10g/l)	Expired in June 2016	Insecticide against caterpillars, white flies and aphids
Herbicides homologués CSP			
Acepronet 400 EC	acetochlore (250 g/1 proméuyne (150 g/1)	Expired in June 2016	Pre-emergent post-sowing herbicide against cotton weeds
Insecticide-Fongicide			
CALTHIO C 50 WS	Thirame (25%+Chlorpyrifos-ethyl 25%)	Expired in November 2016	Insecticide/Fungicide Authorized against Insects and Fungi in Cotton Seed Treatment
Insecticide-Acaricide			
ACARUIS 18 EC	Abamectine	Expire in June 2018	Insecticide/Acaricide authorized against insects and mites in market garden crops.

Table-3: List of pesticides with the same active ingredient and their area of use

active Matter	Pesticide with the same active ingredient	Field of use
Insecticide		
Lambda-cyhalothrin	Lambda super 2.5EC	Lambda-cyhalothrin is used against defoliating caterpillars, tomato worms, aphids, leafhoppers and cucurbit flies [8]. It is rarely offered to control thrips and whitefly
	Karaté	
	Cotofan	
	PACHA 25 EC	
Acetamipride	Capt 88 EC	Acetamipride is used against stinging-sucking insects and leafminers on the main vegetable crops [9].
	Titan 25 EC	
	PACHA 25 EC	
Cyperméthrine	Sharp shooté	Cypermethrin is used against caterpillars: tomato moth, cabbage moth and other defoliating caterpillars (feeding on leaves). It can also be used against aphids, thrips and flea beetles [10]
	Capt 88 EC	
HERBICIDES		
Glyphosate	Glystar	Glyphosate used in pre-emergence , on many crops (wheat, sunflower, rapeseed, winter barley, sugar beet) etc. but in May 2015, this active ingredient is considered to have carcinogen properties by the International Agency for Research on Cancer [5]
	Touch-off	
Pendimthalin	Penthalin	Control of most annual grasses and some broadleaf weeds in corn, potato, rice, cotton, soybean, tobacco, peanuts and sunflower. It is used both before emergence of weeds, and at the beginning of post-emergence. Pendimethalin is classified by EPA in group C, possible carcinogen
	Pendant	

Possible origin of pesticides identified by producers

Figure 2 shows the different origin of pesticides used by producers in the Tabalak pond. According to the producers and sellers surveyed, the pesticides identified come from various origins. Most surveyed people (55%) say that the products used come from Nigeria followed by the agriculture department (16%). The PromAP Project and CAIMA were mentioned as possible sources of pesticides used with a frequency of 10% each. Finally, according to 8% of the producers, some of the pesticides they use come from Cameroon and Ghana.

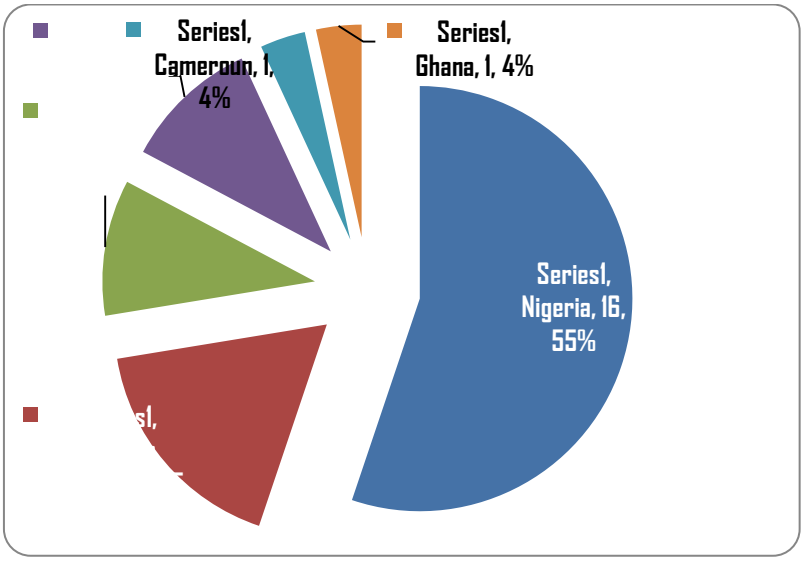

Fig-2: Possible origin of pesticides according to farmers

DISCUSSION

Various works have been carried out on pesticides used against pests and diseases infesting vegetable crops in Africa. Most of the works focused mainly on their environmental impact [11-14]. However, very few studies have been conducted on the diversity of pesticides used by producers in Niger. But, the literature provides very little information on the types and characteristics of pesticides used by Nigeriens, except for the list of CSP taken up by RECA-Niger in 2015. The present study, which aimedto characterize the pesticides used by farmers along the Tabalak pond, is a contribution to the knowledge of the diversity of pesticides. Overall, the results found show a dominance of insecticides. This situation is in relation with importance of the insects attack in this area Herbicides are the second most identified pesticide. This is due to the spread of some weeds in recent years and the difficulty of getting rid of them. Only seven pesticides over 16 are registered by the Sahelian Pesticides Committee (CSP) and the Network of National Chambers of Agriculture of Niger (RECA). The important use of pesticides not approved by the authorities constitutes a risk of contamination and contributes to pollute the environment. Because of their non-selectivity, the pesticide causes the most harmful effects to the environment. The insect pests, even the non-target ones, absorb the pesticides via food or water, air or through their skin or cuticle [11]. The ecotoxicological impact of pesticides in a lotic ecosystem is leaded by multidependant factors. These later which include the properties of the polluting molecules and the biotic and abiotic characteristics of the receiving environment, condition a panel of direct and / or indirect effects on biological organisms [15]. The results of this study reveal that several pesticides have the same active ingredient and most of the latter is exhaled but also constitutes a poison. Thus, Glyphosate is considered carcinogenic by the International Agency for Research on Cancer in May 2015. Pendimthalin is also classified in group C, carcinogenic by the EPA. Another constraint noticed is the use of these unprotected materials, without knowledge of the dose to be applied and without knowledge, for most producers surveyed, without knowledge of the target of each active ingredient. This is a danger to producers, production and the environment. This practice can be explained by the lack of training of producers and sellers in the toxicity of pesticides.

Fig-3: Some photos of pesticides encountered during the survey

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