Volume 3, Issue 1 (Page 033-039)
ISSN: 2709-023X

Risks Associated with the Use of Insecticides in Cowpea Conservation

Chikezie Amare[1], Ezeudo Golibe[1]

[1]Faculty of Basic Medical Sciences, Niger Delta University, Nigeria

Abstract

The use of insecticides by actors in the cowpea value chain highlights the problem of the supposed or real risks of these products with respect to man and his environment. To assess the health and environmental risks generated by these insecticides, we conducted surveys of 100 cowpea producers, 100 insecticide traders, 100 cowpea traders and 100 consumers. According to the results of the surveys, 13 chemicals including 7 pyrethroids, 4 organophosphates and 2 organochlorines are used by cowpea producers and traders in the conservation of cowpea in the central region. Among these insecticides only 2 are approved and the 11 others come from neighboring countries of Burkina Faso, namely Ghana and Togo, despite the control of plant protection and packaging services. The majority of actors surveyed are illiterate (95%). The lack of training and ignorance of the regulations in force on pesticides by insecticide traders, the misuse of chemicals before and after use are factors of environmental pollution. The lack of appropriate protective equipment, ignorance of the existence of approved products and poor food storage conditions create food poisoning among consumers and serious health risks for farmers and traders.

Keywords: Storage, Insecticides, Poisoning, Human Health, Environmental Pollution

Received: February 6, 2022
Revised: March 9, 2022
Accepted: March 20, 2022

Introduction

Nowadays, farmers in Africa and those in Burkina Faso in particular, systematically use insecticides to increase and maintain their production. In recent years (from 2011 to 2013), the quantity of pesticides imported and controlled in Burkina Faso is 4,957,820 kg, including 1,406,184 kg of insecticides. Farmers produce mainly cash crops, namely cotton, market gardening, groundnuts and cowpeas. Cowpea is a food crop, which provides producers with financial income and populations with a very important food source of protein (da Silva et al., 2018). Cowpea production is estimated at 598,525 tons in 2013, an increase of 35.7% compared to the previous campaign, and an increase of 29.5% compared to the five-year average in Burkina Faso. However, one of the major problems of this culture remains the difficulty of its conservation in the medium and long term, due to the heavy infestation by insect pests, the main one being Callosobruchus maculatus.

In Burkina Faso, losses of cowpea during storage due to Callosobruchus maculatus are estimated at more than 800 g/kg after seven months of storage. To better preserve their foodstuffs, producers and traders use traditional methods (mixing seeds with wood ash or fine sand, etc.) and the hermetic storage method using cans and barrels. These methods are certainly effective, but can have drawbacks such as limited effectiveness over time, the inability to preserve a large quantity of foodstuff. An alternative method known as triple bagging is currently offered by the Institut de l'Environnement et de Recherches Agricoles (INERA) to farmers in Burkina Faso and provides very good protection against pests. However, the unit cost of the bag estimated at 1000 CFA francs poses the problem of its accessibility in large quantities by producers. Thus, among all the known and used methods, the use of synthetic

DOI: https://doi.org/10.47667/ijppr.v3i1.138

insecticides seems the least expensive, the most effective and the most widespread. But the use and handling of these insecticides must respect safety rules. The right choice of insecticides and their proper use are very important factors to consider (Popp et al., 2013). The excessive use of insecticides in the preservation of foodstuffs against pests creates serious consequences on the health of users, on that of consumers, on the environment and often causes the elimination of insects with ecological benefit and develops resistance in certain insect pests (Pimentel & Burgess, 2014). The consequences of insecticides on the health of consumers include symptoms such as food poisoning that can sometimes lead to deaths observed by Dabiré and his team in Burkina Faso. In addition, sometimes more serious consequences such as problems of infertility or development of cancers, immune deficiencies, disturbances of neurological and behavioral development, metabolic disturbances and diabetes are observed.

The low level of education of producers and traders means that they do not know how to use insecticides, which increases the risk of poisoning. In addition, they do not benefit from information enabling them to establish the relationship between the pest, its damage, the product to be used, its dose and its frequency. Information on packaging and its future are unknown to users. Observations have been made in Senegal and Benin where recommendations on the proper use of insecticides are not respected as well as the use of adequate equipment. Harm to the environment comes mainly from empty packaging abandoned in nature or its improper burial, which can in either case contaminate groundwater, surface water, pastures and soil (Gruiz, 2014). During this study, the different users of insecticides in the conservation of cowpea, namely producers, traders and sellers of insecticides, were interviewed. The information collected made it possible to assess the risks of using insecticides on human health and the environment in Burkina Faso. This information also made it possible to characterize the cowpea storage systems used by the various actors, to identify the main insecticides used, to analyze the methods of use of insecticides and the risks incurred, to identify the profile of the users of insecticides and know the different risks they incur

Methods

The study was conducted in the central region of Burkina Faso, with Ouagadougou as its capital, where 4 markets in the city of Ouagadougou were visited in order to meet cowpea and pesticide traders. In addition, small cowpea producers were met in two (2) villages around Ouagadougou, namely Saaba (N12°24'29.5"w 001°21'05.1") and Tanghin-Dassouri (N12°11 '59.0006"w 1°52'0.012") (Figure 1). This zone has a Sudano-Sahelian climate that is suitable for cereal crops (millet, sorghum), legumes (groundnuts and cowpeas) as well as market gardening. The choice of this area is justified by a high density of cowpea traders in stocks, a high number of insecticide traders and small cowpea producers.

Surveys were conducted with 100 small cowpea producers (1 to 3 hectares), 100 cowpea traders (wholesalers and retailers) and 100 insecticide traders (retailers and wholesalers). Respondents were randomly selected from markets and villages surrounding Ouagadougou (Figure 1). The surveys took place after the harvests and extended over 6 months (from October 2012 to March 2013). They were carried out using sheets specific to each type of actor and including closed questions and semi-structured interviews. The questions asked of small cowpea producers relate to: a-) knowledge of the insecticides used, namely the types of insecticides, compliance with the prescribed doses, the formulations used, the storage time after application of the insecticides and the number processing during storage.

The conditions of use of insecticides: The visit of the agents of the pesticide control service, the effectiveness of the insecticides used, the attitudes of the producers before and after use of the insecticides, the information they obtained on the poisoning by insecticides, the mixtures

DOI: https://doi.org/10.47667/ijppr.v3i1.138

they make with insecticides, the place of storage of insecticides before their use, the storage systems for foodstuffs treated with insecticides have been identified, the destination of empty packaging, the effects they feel after using insecticides, and finally what they think of using insecticides. The protection equipment and treatments they use and the total number of treatments they carry out.

A survey was conducted among 100 randomly selected insecticide traders in the markets and in the surrounding villages of Ouagadougou (Figure 1). The questions asked relate to the sources of provenance of the insecticides sold, the mastery of the instructions for use, the knowledge of the type of insecticides sold and the storage of the insecticides. We interviewed a total of 100 cowpea traders. These people were also chosen randomly in the markets and in the surrounding villages of Ouagadougou (figure 1). The questions asked relate to knowledge of the insecticides used, their origin, the conditions of their use, the equipment used and the place of storage of the bottles or empty packaging. It was also a question of checking the bottles and sachets of insecticides available to the people surveyed in order to complete the information and finally to discover the storage systems of the treated cowpea before its sale.

A survey was conducted among 100 randomly selected consumers in the city and surrounding villages. The questions asked relate to the discomfort felt after the consumption of cowpea purchased from stockists; and at what precise moment they felt these discomforts if they existed. Consumers are interviewed after buying cowpea from merchants and the questions were asked after consumption of cowpea.

Results and Discussion

Characterization of Storage Systems

The study showed that 24% of cowpea producers in the central region of Burkina Faso preserve their production using traditional methods (cans, barrels, canaries and large bowls in the presence of ashes) and in their homes (bedrooms bedrooms or attics). Also, 8% of traders keep their goods in these same structures. Hermetic methods (plastic bags and triple bottom bags) are used more by producers (47%) against 13% by cowpea traders. As for chemicals, their use is more marked among traders (79% of respondents) than among producers (29%) (Figure 2)

Identification of the Main Insecticides Used

Thirteen (13) chemicals used by cowpea producers and traders were identified from labels, packaging and statements made during the survey. Among the insecticides used, 10 are labeled in English, 2 in French and 1 has no label. Among the insecticides marketed and used, only 23 are authorized for the preservation of foodstuffs. These are a fumigant: Phostoxin (organophosphates) and Actellic Super (pyrethroids).

According to surveys, 95% of cowpea producers and traders use insecticides to preserve their cowpea (Table II). The majority of cowpea traders (89%) use Alumitoxin and 21% mix insecticides in order to obtain a more effective product. The most used products are fumigants including Alumitoxin 89% and Phostoxin 54% of respondents, then Rambo powder which is used by 32% of respondents. The preservation of cowpea by insecticides is the most used method at 99% by traders against 32% for the other methods. The active ingredients identified are permethrin, aluminum phosphide, zinc, lambda-cyalothrin and cypermethrin. These active ingredients are divided into formulations in the form of powder at 69%, liquid at 7% and mode of entry such as fumigants at 23%. Among these insecticides, only Actellic super, Alumitoxin and Toptoxin are recommended for the preservation of foodstuffs according to the Sahelian

DOI: https://doi.org/10.47667/ijppr.v3i1.138

Pesticides Committee (CSP) in 2012. The other insecticides (77%) are neither recognized nor intended to food preservation.

Profile of Insecticide Users and Existence of Risks

The results of the survey revealed an illiteracy rate of 95% among cowpea traders, 87% among producers and 93% among pesticide sellers. In addition, the survey revealed that only 11% of producers have been trained in the use of pesticides against 5% for pesticide sellers and 2% for cowpea traders. Regarding the use of insecticides, no user respects the prescribed dose. According to the results of the survey, 95% of traders and producers do not respect the prescribed doses during the application of insecticides, against only 5% who do. Producers and traders justify this by the fact that the prescribed dose is not lethal to insects. It also appears that only 11% of producers, 5% of cowpea traders and 7% of pesticide traders know how to read a label. This further complicates the situation, especially since the labels are in English and French.

This situation is more alarming at the level of pesticide traders because they are generally responsible for giving advice on the choice and conditions of use of the various chemicals to cowpea traders and producers (Aidoo et al., 2019). Thus, the dosages applied as indicated in Table 2 are not respected. In addition, according to the results obtained, only 39% know that there is a possibility of risk of poisoning by insecticides when the dose prescribed for the use of the insecticide is not respected. Among these are 22% farmers, 13% cowpea traders and 4% pesticide traders. The survey results showed that only 2% of cowpea producers and traders use full equipment to handle chemicals, 4% use gloves, 2% glasses, 4% masks, 2% raincoats, 5% other equipment and 81% do not use any protective equipment because of its high cost, unavailability and inconvenience.

The chemicals used in the preservation of foodstuffs each have a waiting period to respect before consumption. Compliance with this period is intended to reduce the harmful effects of residues from active substances in food (Grein et al., 2007).. The different waiting times observed by users of chemical products are shown in Figure 3. Thus, 49% of producers and traders put their stocks on the market between 15 to 20 days after processing the stocks; 17% of producers observe a waiting period of less than 15 days and only 2% have their stocks 60 days after treatment. This situation shows the level of risk to which consumers are regularly exposed. This risk is all the higher when the chemicals have a high toxicity such as Lambda and Calthio, the deadlines for which are respectively 2 and 3 months.

According to the interviews, pesticide traders indicated that they practice repackaging from the initial container; this consists of transferring the contents of their goods into smaller containers in order to allow retail purchase. If this practice allows a better accessibility of these products to a large number of users, it can also involve enormous risks as well for all the manipulators and the environment. In total, 79% of traders repackage insecticides to resell them in retail. These new containers are not all suitable for containing insecticides.

All actors in the cowpea value chain, producers and traders of cowpea and insecticides have recognized the dangers that insecticides can cause to human health. Most of these actors reported that they had accidental inhalations and poisonings. Pesticide traders have mentioned many pathological cases of which they have been victims.

The Impact of Insecticides on Consumer Health

According to our surveys, cowpea consumers are also victims of various organic disorders, especially when traders sell their treated foodstuffs without observing the recommended

DOI: https://doi.org/10.47667/ijppr.v3i1.138

waiting period. These discomforts occur after consumption of cowpea containing residues of the chemicals used. The use of insecticides, sometimes at very toxic doses, their poor instructions for use (direct contact with the cowpeas) and failure to respect the duration of the persistence of the insecticide (varies between 1 to 3 months), constitute factors causing food poisoning. The main discomforts felt by consumers are food poisoning at 84% (diarrhea, vomiting, bloating and stomach aches), abdominal pain (5%), itching (2%), and insomnia (1%) (Figure 5). 42% of cowpea producers and traders indicated that they keep their insecticides in stores, 34% in bedrooms, 15% in attics, and 12% in other places, (Figure 6) which constitutes a risk of poisoning family members, especially children.

Conditions of Application Of Pesticides

Producers and traders do not respect the list of products approved by the Sahelian Pesticides Committee (CSP), especially since this list is updated every 6 months. Some players in this environment (2 and 4%) are unaware of the existence of structures responsible for the approval and control of pesticides such as the CSP, the National Pesticide Control Commission (CNCP) and the list of approved pesticides. In addition, 89% of pesticide traders do not have an approval, an official document to sell insecticides, which forces them to carry out their activities clandestinely, which is detrimental to the health of the environment.

Regarding the management method for empty insecticide containers, 71% of respondents abandon them in the wild (fields, ponds and landfills), 19% bury them in the ground and 10% incinerate them in the open air. No empty packaging is returned to the various distributors.

In the Ouagadougou region, cowpea appears to be both a food crop and a cash crop for many populations. However, the difficulty of post-harvest conservation of cowpea seeds obliges producers to sell their crops at a lower price (200 CFA francs per kilo) between the months of October and November, whereas the best prices, which amount to 500 CFA francs CFA are observed between the months of February and September. To benefit from better incomes, actors in the cowpea sector frequently and systematically use insecticides to preserve their stocks. Under these conditions, it is likely that these actors do not wait to see the presence of insects in the stocks before undertaking insecticide treatments. However, the use of pesticides for the preservation of foodstuffs obeys rules to minimize the risks that may arise from them. Unfortunately, our results showed that such rules are not respected in the area of our study.

The insecticides listed during the cowpea conservation survey have already been cited for their use in the protection of vegetable crops (Amare et al., 2022). It therefore appears that the majority of insecticides used to preserve cowpea are not appropriate. The use of Lambda Super, a cotton treatment insecticide, to treat cowpea seeds is an illustration of this. Similarly, zinc phosphide, a very toxic rodenticide, is recommended as an external dusting of bags to control rodents and not mixed with grains intended for consumption. This inadequacy in the choice of insecticides is explained by the ignorance of users but also by the free marketing of insecticides.

One of the consequences noted during this study is that the majority of listed insecticides are not registered. The non-registration of commonly encountered insecticides could initially be linked to the multiple pesticide supply circuits. Indeed, the various products used come mainly from the neighboring republic of Ghana, a country that is not a member of the CSP, a sub-regional structure for the approval of pesticides in the space of the Inter-State Council for Drought Control in the Sahel (CILSS). In addition, the sale of pesticides is carried out most of the time in an informal circuit, thus escaping the control of the competent authorities. Thus, in accordance with what is observed in several countries of the West African sub-region, the majority of traders are unaware of the existence of institutions responsible for the approval of

DOI: https://doi.org/10.47667/ijppr.v3i1.138

insecticides. The lack of control in the marketing and use of insecticides then results in various manipulations and repackaging of formulations, all of which has a negative impact on the quality of pesticides.

Another problem highlighted by the results of our study is the misuse of insecticides resulting in non-compliance with recommended doses and conditions of use, the inadequacy of product storage locations and poor management of empty packaging. This set of bad practices harms the environment, the health of consumers and that of users. Our results showed that the main effects felt by the different handlers (cowpea producers, cowpea and insecticide traders) are headaches, colds, coughs, itching, respiratory and vision disorders. These various symptoms are to be correlated with the insufficiency or absence of use of appropriate protective equipment when handling pesticides. The lack of protective equipment during the application of chemicals constitutes a violation of article 2 of the FAO code of conduct (Food and Agriculture Organization 2013) which recommends that all pesticide handlers be equipped with a personal protective equipment. The storage of treated foodstuffs in places of residence increases the health risks mentioned above (Macintyre et al., 2002). The same applies to poor management of packaging, which is often reused to obtain new insecticides. Rejecting empty packaging in the wild is a violation of the regulations in this matter because the FAO recommends the return of empty packaging to distribution houses. This also constitutes a major environmental risk, as has been shown in cocoa, coffee, banana and vegetable growing areas. This mismanagement of packaging must be corrected to preserve the quality of the environment, in particular water, soil and biodiversity.

The results obtained in this study challenge the state of Burkina Faso, in particular, and the entire West African sub-region in general, because we think like that the poisonings noted are a reflection of dysfunction in a country or region, as they reflect regulatory and economic shortcomings and a low level of education of the population. They also highlight the need for the rigorous application of the regulations in force, as well as increased training and awareness of the actors in the communities concerned.

Conclusion

Our study has shown that the majority of cowpea producers and traders use insecticides to the detriment of other conservation methods. Overall, it appears that the chemicals used are inappropriate, unapproved and/or obsolete. In addition, these chemicals are subject to poor practices including non-compliance with doses, repackaging of insecticides, inadequate storage facilities and poor management of packaging after use. Poor phytosanitary practices are the cause of health risks, of which food poisoning is the best perceived by the actors. The poor management of empty packaging could be the source of environmental pollution hitherto unassessed and therefore ignored. The highlighting of these risks opens up prospects for the development of integrated protection alternatives and the more rigorous implementation of existing regulations**.**

References

Aidoo, A. K., Arthur, S., Bolfrey–Arku, G., & Mochiah, M. B. (2019). Pesticides abuse and health implications in Ghana: A review. *International Journal of Environment, Agriculture and Biotechnology*, *4*(3).

Amare, C., Golibe, E., & Adelusi, A. (2022). Risks Associated with the Use of Insecticides in Cowpea Conservation. *International Journal Papier Advance and Scientific Review*, *3*(1), 1-7.

DOI: https://doi.org/10.47667/ijppr.v3i1.138

da Silva, A. C., da Costa Santos, D., Junior, D. L. T., da Silva, P. B., dos Santos, R. C., & Siviero, A. (2018). Cowpea: A strategic legume species for food security and health. In *Legume Seed Nutraceutical Research*. IntechOpen.

Grein, K., Papadopoulos, O., & Tollis, M. (2007). Safe use of vaccines and vaccine compliance with food safety requirements. *Revue scientifique et technique-Office international des épizooties*, *26*(2), 339.

Gruiz, K. (2014). Abandoned and contaminated land. *Engineering Tools for Environmental Risk Management*, *1*, 77-91.

Macintyre, S., Ellaway, A., & Cummins, S. (2002). Place effects on health: how can we conceptualise, operationalise and measure them?. *Social science & medicine*, *55*(1), 125-139.

Pimentel, D., & Burgess, M. (2014). Environmental and economic costs of the application of pesticides primarily in the United States. In *Integrated pest management* (pp. 47-71). Springer, Dordrecht.

Popp, J., Pető, K., & Nagy, J. (2013). Pesticide productivity and food security. A review. *Agronomy for sustainable development*, *33*(1), 243-255.

DOI: https://doi.org/10.47667/ijppr.v3i1.138