

SOCIOECONOMIC CHARACTERIZATION OF FAMILY FARMERS, TRADE, USE AND POISONING BY PESTICIDES IN ARAPIRACA/AL, BRAZIL

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ABSTRACT - This research aimed to socio-economic characterization of family farmers, to quantify trade, use and cases of pesticide poisoning in Arapiraca/AL. Interviews were conducted with 31 family farmers, eight pesticide retailers, as well as a retrospective and documentary research on exogenous poisoning between 2008 and 2018. It was observed that there is a predominance of male labor (64.5%) among farmers interviewed, low level of education (61.3%) who, despite receiving technical assistance (90.3%), do not have access to credit lines (74.2%), reflecting on the low family income. The most cited pesticides among users were insecticides, with prevalence to extremely toxic (36.4%). The lack of training of farmers (71%), associated with low educational level and lack of educational campaigns may have influenced the inappropriate use of PPE (48.4%), reflecting in the 766 records of pesticide poisoning in Arapiraca. Regarding the volume sold in 2018, led the herbicide 2,4-D, with more than 214,600 liters sold. This information shows that exogenous poisoning is a public health problem and that the monitoring of records and follow-up by health agents, investments in rural extension work and technical assistance may significantly reduce the problem.

KEYWORDS: Rural Work; Occupational Exposure; Technical Assistance.

CARACTERIZAÇÃO SÓCIO-ECONÔMICA DE AGRICULTORES FAMILIARES, COMÉRCIO, USO E INTOXICAÇÕES POR AGROTÓXICOS EM ARAPIRACA/AL, BRASIL

RESUMO - Esta pesquisa objetivou a caracterização sócio-econômica de agricultores familiares, quantificar o comércio, o uso e os casos de intoxicação por agrotóxicos em Arapiraca/AL. Realizou-se entrevistas a 31 agricultores familiares, oito revendedoras de agrotóxicos, além de uma pesquisa retrospectiva e documental sobre as intoxicações exógenas entre 2008 e 2018. Observou-se que há predominância de mão de obra masculina (64,5%) entre os agricultores familiares entrevistados, baixo nível de escolaridade (61,3%) que, apesar de receberem assistência técnica (90,3%), não têm acesso a linhas de crédito (74,2%), refletindo na baixa renda familiar. Os agrotóxicos mais citados entre os usuários foram os inseticidas, com prevalência aos extremamente tóxicos (36,4%). A falta de capacitação dos agricultores (71%), associada ao baixo nível de escolaridade e a falta de campanhas educativas podem ter influenciado o uso inadequado de EPIs (48,4%), refletindo nos 766 registros de intoxicações por agrotóxicos em Arapiraca. Em relação ao volume comercializado em 2018, liderou o herbicida 2,4-D, com mais de 214,6 mil litros vendidos. Estas informações evidenciam que as intoxicações exógenas constituem problemas de saúde pública e que o monitoramento dos registros e o acompanhamento pelos agentes de saúde, investimentos em trabalhos de extensão rural e assistência técnica poderão reduzir sensivelmente o problema.

PALAVRAS-CHAVE: Trabalho Rural; Exposição Ocupacional; Assistência Técnica.

LA CARACTERIZACIÓN SOCIOECONÓMICA DE LOS AGRICULTORES FAMILIARES, COMERCIO, USO Y INTOXICACIÓN POR PLAGUICIDAS EN ARAPIRACA/AL, BRASIL

RESUMEN - Esta investigación tuvo como objetivo la caracterización socioeconómica de los agricultores familiares, cuantificar el comercio, el uso y los casos de intoxicación por plaguicidas en Arapiraca/AL. Se realizaron encuestas con 31 agricultores familiares, ocho comerciantes de plaguicidas, además de una investigación retrospectiva y documental sobre intoxicaciones exógenas entre 2008 y 2018. Se observó que existe un predominio del trabajo masculino (64,5%) entre los agricultores familiares encuestados, bajo nivel educativo (61,3%) que, a pesar de recibir asistencia técnica (90,3%), no tienen acceso a líneas de crédito (74,2%), lo que refleja en bajos ingresos familiares. Los plaguicidas más comúnmente reportados entre los usuarios fueron los insecticidas, con una prevalencia de los extremadamente tóxicos (36,4%). La falta de capacitación para los agricultores (71%), asociada con el bajo nivel de educación y la falta de campañas educativas pueden haber influido en el uso inapropiado de EPP (48,4%), lo que se refleja en los 766 registros de intoxicación por plaguicidas en Arapiraca. En relación con el volumen vendido en 2018, lideró el herbicida 2,4-D, con más de 214,6 mil litros vendidos. Estas informaciones muestran que las intoxicaciones exógenas son problemas de salud pública y que el monitoreo de los registros y el acompañamiento por parte de agentes de salud, inversiones en trabajos de extensión rural y asistencia técnica podrán reducir significativamente el problema.

PALABRAS CHAVE: Trabajo Rural; Exposición Ocupacional; Asistencia Técnica.

INTRODUCTION

In Brazil, there are 5.1 million agricultural establishments, with a population of 15.1 million inhabitants, throughout over more than 351 million hectares. Of these, 77% are characterized as family farmers (IBGE 2019a), which occupy 24.3% of the area and generate 38% of the value produced by the agricultural sector (CODAF 2019). According to the Law No. 11,326/2006, family farmers are those who practice activities in the rural area, have an area of up to four fiscal modules, labor and management of the enterprise by the family, and income linked to the establishment itself.

Brazilian family farming is the 8th largest food producer in the world, with revenues of US\$ 84.6 billion/year. This category is responsible for 70% of national beans, 34% of rice, 87% of cassava, 46% of corn, 38% of coffee and 21% of wheat. The sector is also responsible for 60% of milk production and 59% of the pig herd, 50% of poultry and 30% of cattle (FAO 2019).

Arapiraca city is located in the Agreste Alagoana mesoregion, has 2,930 agricultural establishments, 76.5% of which are family-based, with an area of up to 10 ha (78.1%), which cultivate permanent, temporary species and pastures (IBGE 2019b). Historically, the municipality has been known for tobacco growing, cultivated by small and medium-sized owners. However, since the 1990s, due to the decline in international prices and high production costs (Souza 2009), the tobacco sector has shown a reduction in the number of establishments and jobs (AFUBRA 2019).

As an alternative to tobacco, Arapiraca microregion has been consolidating the diversified production of agricultural products. Encouraged by Local Productive Arrangements (LPA) Horticulture, the region became responsible for the supply of vegetables in the State, also exporting to Pernambuco, Sergipe and Bahia (Barboza et al. 2016), highlighting coriander, lettuce, cabbage, peppers and chives as the most cultivated species (IBGE 2018c). Pineapple, cassava, tobacco, beans, corn and pasture crops are part of the production chain (IBGE 2018d).

Even with the migration of agricultural activity, there was no change in the management practices of pesticides used in tobacco cultivation, such as purchase without technical recommendation, application of

products without personal protective equipment (PPE), in addition to the inappropriate disposal of packaging (Silva et al. 2013), reflecting the workers' exposure to intoxication problems, environmental contamination and the presence of post-harvest residues (Łozowicka et al. 2015). According to Silva et al. (2013), 76% of the producers did not return the packaging in the places indicated on the product invoice, having as destination the common garbage, burial or burning, being a problem inherent to most family farmers. This inadequate management placed Arapiraca as the municipality with the highest number of cases of pesticide poisoning notifications in the State (Passos 2019).

This research aims to investigate the socio-economic profile of family farmers in Arapiraca/AL, the trade, the use of pesticides and the cases of poisoning.

MATERIAL AND METHODS

The research was carried out in Arapiraca/AL, in the Agreste region of the State of Alagoas (9°45'6" and W 36°39'37"), between 2018 and 2019. The sample definition followed the recommendations of Miot (2011), for qualitative variables. Considering that in Arapiraca there are 200 family farmers registered to CadÚnico of the Ministry of Citizenship, it was determined that the sample was composed of 31 family farmers. There are 12 pesticide dealers in Arapiraca, of which eight were interviewed.

To characterize the target audience, a qualitative research was carried out, using a semi-structured questionnaire, interviewing 31 family farmers, obtaining information about gender (male, female), age (<30, 31 to 60 and > 60 years old), marital status (married, single), education (illiterate, incomplete or complete elementary school, and high school), receiving technical assistance, rural credit and monthly family income (reais). Information was requested on the pesticides used and the crops in which the products are applied, as well as the frequency of application. Thus, the number of times that each active ingredient was mentioned by the producers was counted.

Information on the use of personal protective equipment (PPE), symptoms of intoxication after application, participation in courses or training on the use of pesticides, if they have already heard about educational campaigns on pesticides and if they have adequate places for storing products and packaging on the property were also obtained.

A survey was carried out of the active ingredients of pesticides most commercialized in Arapiraca, based on information obtained from eight dealers, considering the year 2018.

The cases of exogenous poisoning by pesticides were obtained from a retrospective and documentary, quantitative, descriptive study of the time series of secondary data referring to the records coming from the Notifiable Diseases Information System (SINAN), between 2008 and 2018, from data provided by the Arapiraca Epidemiology Coordination, service protocol 67AC.E472. The following variables were analyzed: gender, age group, education, place of exposure, purpose of use, activity performed, active ingredients of pesticides, circumstances of contamination and evolution.

This research had its project submitted for analysis by the Research Ethics Committee, through Plataforma Brasil, having a consubstantiated opinion approved "without ethical obstacles", under number 3,448,573, according to CNS resolution No. 510/16.

RESULTS AND DISCUSSION

It was found that 64.5% of the interviewed farmers are male, with ages ranging from 31 to 60 years old (61.3%), married (83.9%) and with a low level of education, in which 61.3% % even have incomplete

primary education. According to Mattei (2015), the masculinization of rural areas is predominant, mainly in the family production environment, not only in Alagoas (76% of establishments), but in Brazil (81%) (IBGE 2019a). However, the activities carried out by women (agricultural and non-agricultural), diversify the family income, even under precarious conditions and without labor guarantees. The rural exodus, mainly of young people, was observed in the present study, considering that 12.9% of the farmers are under the age of 30. According to Foguesatto et al. (2016), unhealthy work, lack of motivation and autonomy in carrying out agricultural activities, irregular income and climatic instability are responsible for the migratory movement of young farmers.

Considering the level of education, 9.7% are illiterate and 51.6% have not completed elementary school. This is a characteristic observed in the Brazilian rural environment, since 78.7% of the producers have completed elementary school and, of these, 15.4% have never attended school. Alagoas has 86.6% of farmers with primary education and 24.1% are illiterate. In Arapiraca, 29.8% never attended school (IBGE 2019d). For the producer to have access to credit lines, to take advantage of technical and scientific innovations, as well as to guarantee the sustainable use of natural resources, a higher level of education is necessary. Regarding the use of technologies, Leite et al. (2016) observed that the low level of education made it difficult to understand the information contained in pesticide labels, which is one of the most relevant factors in exogenous intoxications. Likewise, Oliveira et al. (2012) concluded that the low level of education was responsible for the intensive use of the soil and for the felling of native vegetation, for subsistence, for not knowing alternatives of agricultural production.

It was observed that 90.3% of the interviewed producers received rural technical assistance by the Municipal Secretary of Agriculture, which involves orientation on practices of control of plant pests and diseases, use of fertilizers (before the chemical analysis of the soil), seedling production, irrigation (drip) and adequate management in the use of pesticides (application, PPE, product storage, disposal empty packings of pesticides). Although there is no organic producer, the preferred technical recommendations are based on agroecological production.

Even receiving technical guidance, it is known that producers make it possible to follow them for lack of financial resources to purchase inputs, resistance to the adoption of new technologies, distrust or lack of interest (Landini 2015). This may have reflected in the 74.2% did not have access to credit lines for investments in agricultural activity, reflecting on the low family income (up to 1 salary). According to Foguesatto et al. (2016), the lack of satisfactory income is one of the main motivators of the rural youth exodus. However, Sousa et al. (2016) demonstrated that the lack of information and bureaucratic difficulties were overcome by technical assistance, with an increase in the acquisition of credit by rural producers, mainly women, following the issuance of the declaration of suitability to PRONAF, with investment in 75 operations, among them, dairy cattle, sugar cane, handicrafts and infrastructure of the property.

It was observed that all interviewed family farmers use pesticides, in which insecticides, fungicides and herbicides were more used, respectively, in the different production systems (Table 1). Extremely toxic products predominated (36.4%), with emphasis on insecticides. Tebuconazole and imidacloprid stood out as the most used. In addition to these, glyphosate, macozebe, atrazine, diuron and methomyl are among the 20 most commercialized in Brazil and Alagoas (IBAMA 2018) and used by producers in Arapiraca/AL.

Table 1. Main pesticides used by family farmers in Arapiraca/AL and the cultivated species.

Active principles	No. citation	Type	Toxicological class	Agricultural use
Atrazine	1	Herbicide	III	<i>Manibot esculenta</i> ¹ , <i>Nicotiana tabacum</i> ¹ , <i>Zea mays</i>
Diuron	8	Herbicide	III	<i>Ananas comosus</i> ¹
Flumioxazin	6	Herbicide	II	<i>Ipomoea batatas</i>
Glyphosate	4	Herbicide	IV	<i>Psidium guajava</i> , <i>Malpighia emarginata</i>
Cipermethrin	9	Inseticide	I	Vegetables, <i>N. tabacum</i> , <i>M. esculenta</i> , <i>I. batatas</i> ¹
Deltamethrin	9	Inseticide	I	<i>M. esculenta</i> ¹ , <i>Dioscorea sp.</i> ¹ , <i>I. batatas</i> , <i>N. tabacum</i> , <i>Z. mays</i>
Imidacloprid	11	Inseticide	II	<i>A. comosus</i>
Methomyl	9	Inseticide	I	Vegetables, <i>N. tabacum</i> , <i>M. esculenta</i> , <i>I. batatas</i> ¹
Azoxystrobin	7	Fungicide	III	Vegetables, <i>N. tabacum</i>
Mancozeb	1	Fungicide	II	<i>P. guajava</i> , <i>I. batatas</i>
Tebuconazole	13	Fungicide	I	<i>A. comosus</i> , <i>P. guajava</i> , <i>M. emarginata</i>

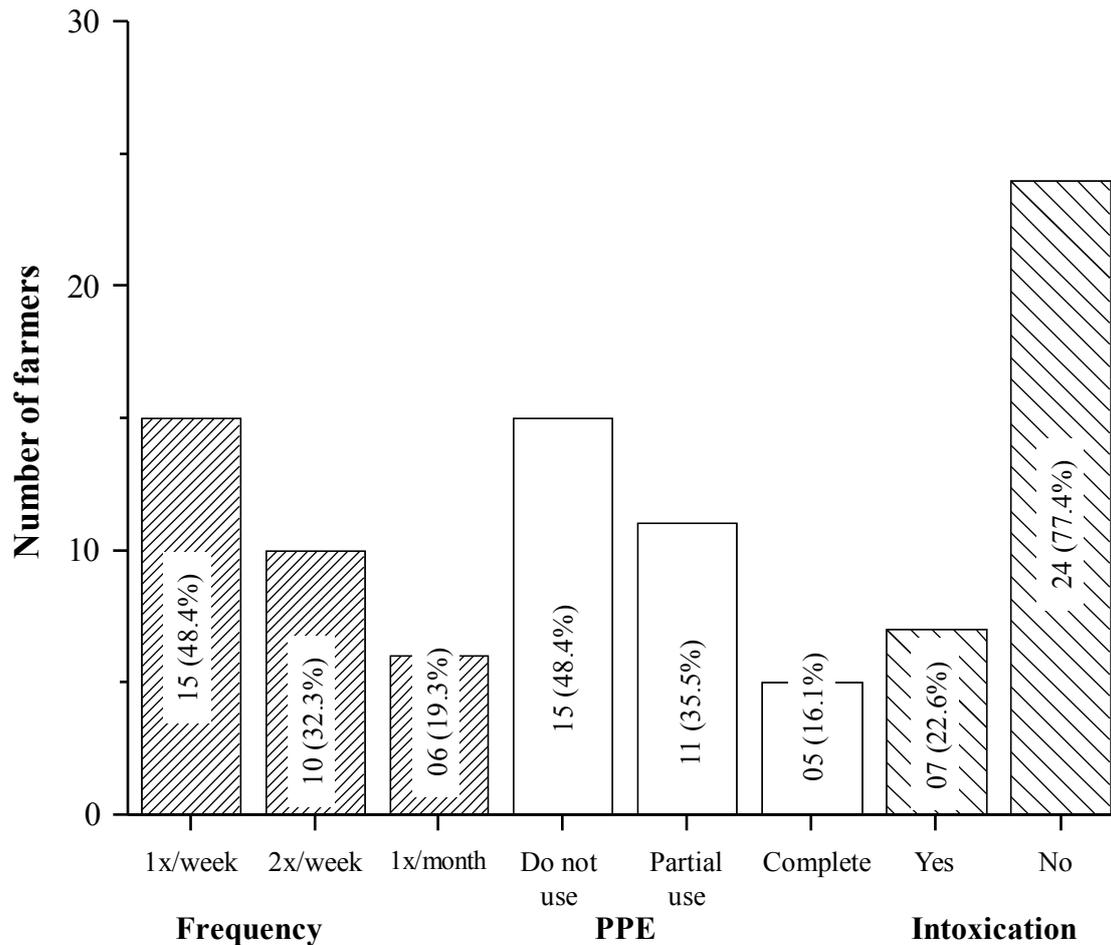
¹Agricultural crops in which the pesticide is used without the manufacturer's indication on the package insert.

Although family farmers in Arapiraca receive technical assistance, the application of pesticides is a recurring practice, probably due to the familiarity that producers have with pesticides, due to the long period of growing of *N. tabacum*, species highly dependent on pesticides (Santos et al. 2017). This familiarity resulted in applications of formations in species not indicated or tested by the manufacturer, such as the herbicide Atrazine, recommended for use in grass crops, being applied in *M. esculenta* and *N. tabacum* (Table 1). Likewise, the Methomyl insecticide, used to control *M. esculenta* pests. In addition to not efficiently controlling the target species (weed, insect pest or disease), it can negatively affect the crop, such as *N. tabacum*, which is considered very sensitive to Atrazine (Vargas et al. 2006). It can also promote environmental and product contamination, as there is no recommendation by the manufacturer of the dose to be applied and information on the grace period, which may reduce productivity and, consequently, profitability.

It was observed that the main pesticides used in tobacco cultivation, such as imidacloprid, deltamethrin and azoxystrobin (Santos et al. 2017), are part of the productive system of family farmers in Arapiraca (Table 1). It is possible that in the transition from tobacco cultivation to other agricultural species, the use of the same pesticides has remained, due to the affinity of producers with the products, even though they are not specific to the crops to which they are being applied (for example, deltamethrin in *M. esculenta*, Table 1).

Despite the application of pesticides is conditioned to the level of damage of the insect pest or disease, it was observed that 32.3% of farmers make weekly applications (Figure 1), disregarding the product's grace period, since insecticides and fungicides have an interval between applications of at least seven days, according to the manufacturers. Similar results were found by Castro and Confalonieri (2005), where 35% of respondents (n = 40) from the Municipality of Cachoeiras de Macacu/RJ and also by Castro et al. (2018), in Palmas/TO, in which 27.8% of producers (n = 39) applied twice a week in community gardens. Failure to follow the manufacturer's recommendation may cause intoxication in workers (ANVISA 2019), contamination of the environment, of fruit and vegetables (Shinohara et al. 2017) and the death of natural enemies from pests (Bomfim et al. 2015).

Figure 1. Distribution of family farmers in Arapiraca/AL according to the frequency of application of pesticides, use of PPE and exogenous intoxication (n = 31 respondents).



Even recognizing the importance of using PPE, 48.4% of the interviewees do not use it in the preparation and application of the products (Figure 1), with discomfort as the main justification, due to the high temperatures of the Arapiraca semi-arid climate. Although not mentioned, the value of PPE is also one of the requirements mentioned by producers (Lima et al. 2015). It was also observed that the partial use of PPE, without full clothing, also does not bring protection to the applicator, so that 22.6% indicated that they had already suffered some intoxication symptoms during or after the application, in which dizziness, respiratory failure, headache, nausea, vomiting, itching and swelling of the skin, irritation in the nose, throat and eyes were the most cited. These are cases of acute poisoning, however, according to Pignati et al. (2017), prolonged exposure to pesticides and recurrent cycles of acute intoxication can cause subacute and chronic intoxication, with irreversible damage, such as cancer, fetal malformation and death.

Social vulnerability factors, due to the low level of education, low family income and lack of credit, may have influenced the 71% of respondents who were never trained in the use of pesticides, nor were they aware of educational campaigns (54.8%), and do not have an adequate place to store pesticides on their property (38.7%), which are kept away from animals, children and unprotected people. The provision of training courses for producers on the management of pesticides, within the principles of environmental protection, food security and workers' health, could minimize the problems.

According to Viero et al. (2016), access to information and technical knowledge provided by participatory educational processes is essential so that farmers who use pesticides in their work activities are minimally qualified to use them. According to Mariani et al. (2005), 87.9% of rural producers who took courses considered that professional training improved the quality of products, working conditions and quality of life. For Querino

et al. (2017), in the process of raising awareness about the correct handling of pesticides, in addition to obtaining data, investment in interventional actions is necessary. By associating these two factors, it is possible to identify the main needs of the community and, together with it, to build means by which one can have more safety at work and a better quality of life for the entire community.

Regarding the storage of pesticides, it was possible to verify the inadequacy of the locations. Although most affirm that they have an adequate place, they do not comply with the guidelines of standards such as NBR No. 9,843/2004 (ABNT), which establish rules for the adequate storage of pesticides, aiming at guaranteeing the quality of products, as well as preventing accidents. In the study by Carvalho et al. (2016), most pesticides (64.9%) were stored incorrectly in temporary deposits and in the field itself. Another study by Bernardi et al. (2018) evidenced the presence of inadequate facilities, precarious and built only with plastic tarps, with exposed soil and, at times, without ventilation, where handling took place inside these facilities.

A total of 11 active ingredients that were most commercialized by eight resellers in Arapiraca/AL were accounted for, especially the extremely toxic ones, with 54.5% of the products. The herbicides glyphosate, 2,4-D, atrazine and paraquat, in addition to the imidacloprid insecticide are part of the ranking of the 20 most used pesticides in Brazil (IBAMA 2018).

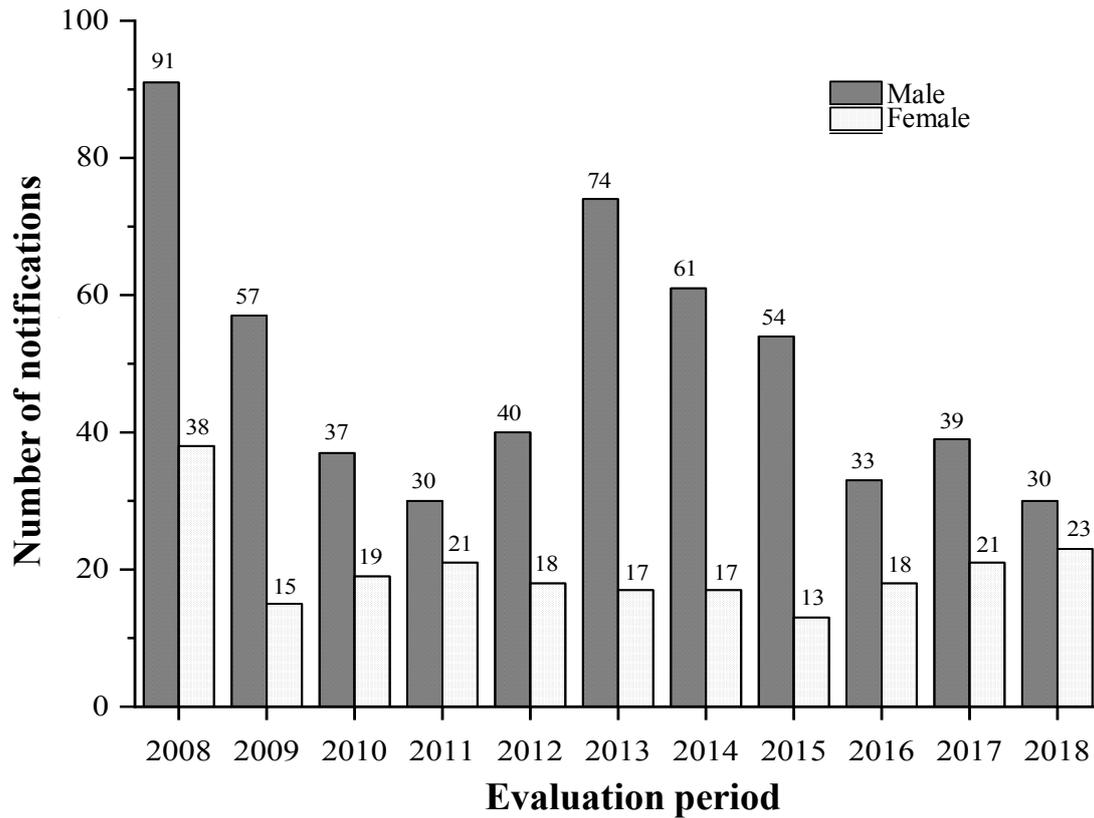
In relation to the volume sold, it leads the herbicide 2,4-D, with more than 214.6 thousand liters sold in 2018. As it is extremely toxic and highly soluble in water, it can be easily leached into the soil, coming into contact with the sheet water (Silva et al. 2007), remaining in the environment for more than 2.5 years (Baumgartner et al. 2017). Even though ANVISA (2019) concluded that the maximum levels of residues found in food and water do not promote risk to the population, it was identified that the contact time that rural workers are exposed to can bring health problems, so that new criteria were defined and that should be changed in the product registration and package insert by the manufacturers.

Although 2,4-D is the most sold herbicide in Arapiraca, it is not among those used by family farmers (Table 1), so this pesticide may be used in productive systems not covered by Law No. 11,326/2006, such as cattle ranchers, in areas of forage grasses or in crops of other grasses (*S. officinarum* and *Z. mays*).

Other pesticides were cited by dealers as the most sold, such as Glyphosate (76,004 L), Paraquat (34,035 L), Atrazine (4,000 kg), Cipermethrin (2,120 L), Lambda-Cyhalothrin (1,832 L), Sulfentrazone (890 L), Deltamethrin (500 L), Tebuconazole (350 kg), Flumetralin (120 kg) and Imidacloprid (100 kg).

Between the years 2008 and 2018, a total of 766 notifications of pesticide poisoning were registered, with a predominance of males (497 individuals), in which the years 2008 and 2013 had the highest records (Figure 2). These data may reflect the growth of the agricultural sector and the consequent increase in the use of pesticides in the region. According to Bombardi (2017), Arapiraca is among the five municipalities in the State of Alagoas that use pesticides the most, representing 60.9% of its agricultural establishments (IBGE 2019d), without adequate use of PPE (83.9%, Figure 1).

Figure 2. Distribution of notifications of exogenous poisoning by pesticides for agricultural use, registered in Alagoas between the years 2008 to 2018, according to gender. (n = 766 notifications).



The most affected age group of intoxications was between 15 and 49 years old, which represents the economically active population, responsible for 76.61% (587 individuals) of the notifications (Table 2). It was observed that 70 children and adolescents, between 0 and 14 years old, were intoxicated, probably due to inadequate packaging storage or due to the contribution of labor in the field of adolescents to help maintain family income. According to the Statute of Children and Adolescents (Law No. 8,069/1990), the participation of children under 16 in degrading, dangerous or unhealthy activities, characteristics of work in the field (regulatory rule - NR 31) is prohibited.

Table 2. Distribution of notifications of exogenous poisoning by pesticides for agricultural use, registered in Arapiraca/AL between the years 2008 to 2018, according to the age group.

Age groups (years)	Number of notifications	%
< 1	4	0.52
1 to 9	40	5.32
10 to 19	138	18.01
20 to 29	209	27.28
30 to 39	164	21.40
40 to 49	102	13.31
50 to 59	50	6.52
60 to 69	44	5.74
> 70	15	1.90
Total	766	100.0

Workers who studied up to incomplete high school (29.5%), a characteristic of 63.6% of family farmers (IBGE 2019a), were the most affected by pesticides (226 notifications). For Soares et al. (2005), the level of education was one of the determining factors for cases of poisoning by pesticides. It was found that 20% of farmers with less than high school education who applied pesticides suffered some type of intoxication, while 9.8% had at least completed high school. The chances of intoxication for those with at least high school are 57% lower than for those with a lower educational level. The difficulty in understanding the information contained in product packaging and even the agronomic recommendations provided by technical assistance, make producers more prone to intoxications (Leite et al. 2016).

Residences were the places where there were the highest incidences of pesticide poisoning (Table 3), showing the inadequate storage of products by farmers, allowing access and exposure to unprotected people. It is also possible that family farmers, with a low level of education, without technical qualification, may be using pesticides inappropriately in their crops, reflecting on intoxications.

Table 3. Distribution of notifications of exogenous poisoning by pesticides for agricultural use, registered in Arapiraca/AL between the years 2008 to 2018, according to the place of exposure.

Place of exposure	Number of notifications	%
Ignored/White	168	21.93
Residence	409	53.39
Working environment	150	19.58
Path of work	1	0.14
School/Nursery	1	0.14
External environment	27	3.52
Other	10	1.30
Total	766	100.0

The work environment (Table 3) was the second place of exposure to pesticides (19.6%), who used herbicides and insecticides (Table 4), when spraying and when diluting the chemical in the preparation of the syrup before application (Table 5) due, in large part, to the lack of use of PPE. This information may be related to agricultural activity developed in the region. Pesticides with a high degree of toxicity, responsible for exogenous poisoning by pesticides in Arapiraca, are widely used in pasture areas, *S. officinarum*, *Z. mays*, *P. vulgaris*, *N. tabacum* and several other crops not mentioned in this text, but cultivated in the city.

Table 4. Distribution of notifications of exogenous poisoning by pesticides for agricultural use, registered in Arapiraca/AL between the years 2008 to 2018, according to the purpose of use.

Purpose of using	Number of notifications	%
Ignored/White	410	53.52
Inseticide	110	14.36
Herbicide	168	21.93
Tickicide	11	1.43
Rodenticide	1	0.14
Fungicide	15	1.95
Other	4	0.52
Not applicable	47	6.15
Total	766	100.0

Table 5. Distribution of notifications of exogenous poisoning by pesticides for agricultural use, registered in Arapiraca/AL between the years 2008 to 2018, according to the activity performed.

Activity	Number of notifications	%
Ignored/White	414	54.04
Dilution	39	5.09
Spraying	184	24.02
Seed treatment	19	2.48
Storage	5	0.65
Harvest	4	0.52
Transportation	1	0.14
Pest control	7	0.91
Production	1	0.14
Other	15	1.96
Not applicable	77	10.05
Total	766	100.0

Among the pesticides responsible for poisoning in Arapiraca, stood out the herbicides (2,4-D, Glyphosate and Tebuthiuron), insecticides (Chlorpirifos, Cypermethrin, Imidacloprid, Methamidophos) and growth regulators (Ethephon and Flumetralin).

Intentional exposure (attempted suicide) was the main circumstance involved in cases of intoxication (Table 6) in 43.2% of cases, followed by accidental (30%) and usual use in plantations (3.39%). Studies such as those by Gomes et al. (2018b) showed that ease of access to the product is considered the main reason for the use of pesticides in cases of attempted suicide by elderly people in the Northeast.

Table 6. Distribution of notifications of exogenous poisoning by pesticides for agricultural use, registered in Arapiraca/AL between 2008 and 2018, depending on the circumstances.

Circumstances	Number of notifications	%
Ignored/White	15	1.96
Usual uso	26	3.39
Accidental	234	30.54
Environmental	149	19.45
Abuse	6	0.78
Food intake	4	0.53
Attempted suicide	331	43.21
Homicide	1	0.14
Total	766	100.0

As for the intoxications caused by accidental contact, by the usual use in applications and by contact with the product in the environment, these could be avoided by complying with Law No. 7,802/1989, which conditions the handling and use of pesticides to the use of individual protection. The destination of empty packaging is also important for the occurrence or not of contamination. Inappropriate destination (burning, reuse and others) is a breach of Decree No. 4,074/2002 and CONAMA Resolution No. 465/2014, which provide

for the final destination of pesticide packaging and oblige the consumer to return the empty packaging to the commercial establishment indicated on the invoice.

Despite the high rate of suicide attempts using pesticides, more than 94% of cases were cured without sequelae, with 23 deaths recorded (Table 7).

Table 7. Distribution of notifications of exogenous poisoning by pesticides for agricultural use, registered in Arapiraca/AL between the years 2008 to 2018, according to the evolution of the poisoning.

Poisoning	Number of notification	%
Ignored/White	15	1.96
Cure without sequels	723	94.38
Cure with sequels	3	0.39
Death due to exogenous intoxication	23	3.0
Loss of follow-up	2	0.27
Total	766	100.0

The absence of information (ignored/blank) about poisoning reports regarding place of exposure, purpose of use, activity performed, circumstances and intoxication evolution (Tables 3, 4, 5, 6 and 7) makes it impossible effective action, by public health agents, that can mitigate the problem.

CONCLUSIONS

Characteristics of family farmers are the predominance of the male gender, with a low level of education, aged between 31 and 60 years who, despite having technical assistance, do not have access to credit lines, reflecting on the low family income. All interviewed producers use pesticides that, in handling, there is the absence of use of PPE, of adequate storage location, and inadequate application frequency, reflecting in acute intoxications.

In Arapiraca, eleven active ingredients of pesticides are the most commercialized, highlighting the herbicide 2,4-D, with 214.6 thousand liters sold. Considering the characteristics of the producers and the handling of the products, 766 records of acute intoxications were reported between 2008 and 2018, in which individuals between 15 and 49 years of age, with a low level of education were the biggest victims, intoxicated in the homes and work environment in the city application of the products.

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