

CUIDADO É FUNDAMENTAL

UNIVERSIDADE FEDERAL DO ESTADO DO RIO DE JANEIRO • ESCOLA DE ENFERMAGEM ALFREDO PINTO

RESEARCH

DOI: 10.9789/2175-5361.2017.v9i2.466-472

Fumicultura: uso de equipamento de proteção individual e intoxicação por agrotóxico

Tobacco farming: use of personal protective equipment and pesticide poisoning

El cultivo de tabaco: el uso de equipo de protección personal y la intoxicación por plaguicidas

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Article extracted from the paper *Demographic, socioeconomic and health profile of tobacco farmers families in a city of southern Brazil*. Paper presented at the Post-Graduate Nursing Program of the Federal University of Rio Grande do Sul, Porto Alegre, in March 2013.

How to quote this article:

Cargnin MCS; Echer EC; Silva DR. Tobacco farming: use of personal protective equipment and pesticide poisoning. *Rev Fund Care Online*. 2017 abr/jun; 9(2):466-472. DOI: <http://dx.doi.org/10.9789/2175-5361.2017.v9i2.466-472>

ABSTRACT

Objective: To verify the use of Personal Protective Equipment (PPE) and the presence of symptoms of intoxication by pesticides in tobacco farmers. **Methods:** Cross-sectional study with farmers of the northwest of the state of Rio Grande do Sul in 2012/2013 through a household survey with interview. **Results:** Participants were 100 male farmers, they were on average 46.9 ± 10.8 years-old; 97 (97.0%) used pesticides; 81 (81.0%) reported using PPE; 20 (20.0%) had symptoms of intoxication. **Conclusions:** Workers make partial use of PPE, it may favor the emergence of health problems related to pesticides. It is necessary that health workers, along with these workers, to incorporate into practice the comprehensive health assistance encompassing prevention, promotion, assistance and reporting of cases of poisoning.

Descriptors: Worker's health, Rural workers, Pesticides, Nursing.

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RESUMO

Objetivo: Verificar o uso de Equipamento de Proteção Individual (EPI) e a presença de sintomas de intoxicação por agrotóxicos em fumicultores.

Método: Estudo transversal realizado com fumicultores do noroeste do estado do Rio Grande do Sul em 2012/2013 por meio de inquérito domiciliar com aplicação de entrevista. **Resultados:** Participaram 100 fumicultores homens com média de 46,9±10,8 anos; 97(97,0%) fizeram aplicação de agrotóxicos; 81(81,0%) relatam utilizar EPI; 20 (20,0%) apresentaram sintomas de intoxicação. **Conclusões:** Os trabalhadores fazem uso parcial de EPI o que pode favorecer o surgimento de problemas de saúde relacionado aos agrotóxicos. Neste sentido faz-se necessário que os trabalhadores da saúde, aliados com estes trabalhadores, incorporarem na sua prática a assistência integral à saúde englobando prevenção, promoção, assistência e notificação dos casos de intoxicação.

Descritores: Saúde do trabalhador, Trabalhadores rurais, Agrotóxicos, Enfermagem.

RESUMEN

Objetivo: Verificar el uso de Equipo de Protección Personal (EPP) y la presencia de síntomas de intoxicación por pesticidas en los cultivadores de tabaco. **Métodos:** Estudio transversal con los productores del noroccidental estado de Rio Grande do Sul en 2012/2013 a través de una encuesta de hogares con aplicación entrevista. **Resultados:** Los participantes fueron 100 cultivadores hombres con una media de 46,9±10,8 años, 97 (97,0%) eran de aplicación de plaguicidas; 81 (81,0%) reportó el uso de PPE; 20 (20,0%) tenían síntomas de intoxicación. **Conclusiones:** Los trabajadores hacen uso parcial de EPP que puedan favorecer la aparición de problemas de salud relacionados con los plaguicidas. En este sentido, es necesario que los trabajadores de la salud, junto con estos trabajadores incorporan a la práctica la atención de la salud global que incluya la prevención, promoción, asistencia y la notificación de los casos de intoxicación.

Descritores: Salud del trabajador, Trabajadores rurales, Plaguicidas, Enfermería

INTRODUCTION

Brazil is, since 1993, the world's largest exporter of tobacco, followed by India, the United States and Zimbabwe, and the second largest tobacco producer, just behind China.¹⁻²⁻³⁻⁴ Thus, to ensure a good quality leaf, tobacco production requires intensive pesticide use.⁵

Brazil is, since 2008, the major consumer of pesticide in the world.⁶ It is estimated that two-thirds of existing pesticides are used in agriculture.⁷ The use of pesticides has been widespread in agriculture, especially in the last 30 years, expanding rapidly in the last decade (190%), a growth rate higher than twice the presented by the global market (93%).⁸⁻⁹⁻¹⁰

In Rio Grande do Sul the use of pesticides is near twice the national average.¹¹ According to Decree No. 4074 of January 4, 2002 which regulates the Federal Law No. 7.802/1989, defines pesticides, among others, as:

“Every product of physical, chemical or biological processes, used in the sectors of production, storage and processing of agricultural products, which has the

purpose of changing the composition of flora and fauna to preserve it from harmful actions of harmful living beings; as well as substances used as defoliants, dessiccants, growth inhibitors and stimulants.”^{12:1}

Tobacco growing is an exclusively rural activity, carried out entirely manually from planting to harvesting.¹³ It is characterized by intensive use of pesticides and a large number of workers are directly exposed to these chemicals during cultivation of tobacco.¹⁰ In Brazil, according to estimate of the Association of Tobacco Growers in Brazil (AFUBRA), during the 2014/15 harvest, tobacco farming involved 168,530 families in 14 of the 26 federate states.¹⁴

In recent years, the amount of pesticides used in the tobacco production has been reduced in Brazil. However, the number is still high and causes concern as they result in serious damage to health, particularly when manipulated without use of PPE.¹⁵

The mandatory provision of PPE to employees was initially described by the Consolidation of Labor Laws, Law No. 5452 in 1943, and later in Ordinance No. 3214, 1978 by Regulatory Standard (NR)⁶. PPE is considered “every device or product, for workers’ individual use, for the protection from risks susceptible to threaten the safety and health at work”.^{16:1} Currently, NR 31 deals with the safety and health at work in areas such as agriculture, livestock and forestry, and describes the PPE to be used according to the needs of each work activity.¹⁷

By not using PPE, or using it only partly the worker is subject to the absorption of pesticides, which may occur through the respiratory, dermal and oral tracts, and may cause acute or chronic poisoning. A study developed about tobacco farmers, in the municipality of Pelotas, Rio Grande do Sul, in 1996, points out that about 6% of respondents said they were intoxicated by the use of pesticides.¹⁸ A qualitative study in 2010 in the same city identified that PPE is little accepted by growers and that these workers use only of some of the equipment because they consider it uncomfortable.¹³

In a study in São Lourenço do Sul, Rio Grande do Sul, 7% of growers reported that they had had at least one episode of pesticide poisoning in their lives, moreover, it found a linear association between the number of poisoning by pesticides and minor psychiatric disorders.¹⁰

Studies with tobacco growers have pointed out a greater risk of developing neurobehavioral alterations that could develop into cases of depression and suicide among the group associated with the use of pesticides.^{15,19-20-21} In addition, other Brazilian studies²²⁻²³ identified association between exposure to pesticides and psychiatric problems.

In a study conducted in the United States, researchers also identified other factors that affect the mental health of rural workers, such as discrimination, poverty, and stressors involving prolonged separation from the family, social marginalization, poor housing and living conditions and documentation problems.²⁴

The abuse or misuse of pesticides intensively contributes to environmental degradation and impacts human health, constituting a major public health problem. It deserves special attention in tobacco farming, characterized as a primary activity developed largely by family farming.²⁵

Thus, it is important to conduct this study to discuss the health of tobacco farmers, as well as to enable health professionals to raise awareness about the risks to which they are exposed and prevention, developing intervention strategies. Moreover, the shortage of articles/research in the national bibliography on the subject also motivated this research.

The objective of this study was to evaluate the use of PPE and the presence of symptoms of intoxication by pesticides in tobacco growers.

METHODS

It is a descriptive epidemiological study, cross-sectional, conducted with 100 tobacco growers, from a municipality in the northwestern region of Rio Grande do Sul, 420 km distant from the capital, where 61% of the population live in rural areas.

The inclusion criteria were to be a rural worker, tobacco farmers of both genders, to develop all stages of tobacco cultivation, to be able to respond to the instrument and to be responsible for the family's tobacco production. No exclusion criteria were established.

To calculate the sample size it was considered the total number of tobacco growing families in the municipality (129), with a confidence level of 95%, a proportion of 50% (as it was not found similar value in the literature) and 0.05 error. Thus, the study sample was at least 97 responsible for tobacco production.

Data collection was carried out through interviews by household survey, in January 2012. The data were collected through an instrument developed by the researchers. Data were entered and organized in a database in Microsoft Excel® and then imported to the Statistical Package for Social Sciences (SPSS) version 18. A descriptive analysis of simple and relative frequency was performed, and of tendencies regarding central and position measures.

The project was authorized by the municipality's Health Bureau and approved by the Research Ethics Committee of the Regional University of Alto Uruguai and Missões (URI) under No. CAAE 0055.0.284.000-11 and all participants signed the Free and Informed Consent Term.

RESULTS

The study included 100 growers responsible for tobacco production, all men, average age of 46.9±10.8 years-old, 72 (72.0%) were Caucasian, 90 (90.0%) were married, most, 89 (89.0%), had children with a median of 3.0 (IQR = 1.0-3.0) children and average of 6.0±2.5 years of study.

Among those who applied one or more pesticide products in the field, there was the report of symptoms of poisoning such as vomiting 14 (22.6%), nausea 10 (16.1%), dizziness 10 (16.1%), headache 10 (16.1%), malaise 5(8.1%), fever 3 (4.8%), diarrhea 2 (3.2%), body aches, chills, abdominal cramps, coughing, burning skin, itching in the body, bitter taste in the mouth and epigastric pain 1 (1.6%), respectively. It should be noted that the symptoms were reported by the head of the family of tobacco production, pesticides exposure tests were not performed to prove it.

The tobacco growers have reported the use of PPE, but not completely. The equipment used are boot/gaiter 71 (87.7%), overalls 66 (81.5%), sleeves (81.5%), mask 65 (80.2%), visor 19 (23.5%), trousers 12 (14.8%), protective glasses 11 (13.6%), hat 9 (11.1%), cap 8 (9.9%), shirt 8 (9.9%), hood/apron 4 (4.9%) and jacket 2 (2.5%).

Table 1 - Use and symptoms of pesticides and use of PPE reported by the responsible for the production of tobacco in a municipality in the northwestern region of Rio Grande do Sul in 2013

Variables (n = 100)	n (%)
Pesticide use	
Yes	97 (97.0)
No	3 (3.0)
Intoxication symptoms	
Yes	20 (20.0)
No	80 (80.0)
PPE use	
Yes	81 (81.0)
No	19 (19.0)

Source: Research data.

The tobacco growers reported having used 39 types of pesticides in agriculture, and the most frequent are bud growth inhibitors 97 (97.0%), followed by herbicides 94 (94.0%), insecticides 90 (90.0%) and fungicides 38 (38.0%). The most used bud growth inhibitor was Primeplus 95 (97.0%).

Among the herbicides, there are Roundup 59 (40.7%) and Gamit 30 (20.7%), of toxicological rating III, considered moderately toxic. Among the insecticides, there are Karate 41 (31.5%), of toxicological rating III, considered moderately toxic, and Orthene 36 (27.7%), belonging to the group of organophosphates of toxicological classification IV, considered low toxicity (Table 2).

Among the fungicides there are Rovral 15 (28.3%) and Ridomil 6 (11.3%), of toxicological rating III, considered moderately toxic, and the Infinito 6 (11.3%), of toxicological classification II, highly toxic. Some growers 7 (13.2%) did not remember the name of the products used at the time of interview.

Table 2 - Pesticides referred to by those responsible for the production of tobacco in a municipality in the northwestern region of Rio Grande do Sul in 2013

Variable (n = 100)	n (%)
Bud growth inhibitor*	97 (97,0)
Primeplus	95 (97,0)
Does not remember	2 (2,0)
Pódos	1 (1,0)
Herbicide*	94 (94,0)
Roundup	59 (40,7)
Gamit	30 (20,7)
Glifosato	13 (9,0)
Extrazin	10 (6,9)
Primatop	10 (6,9)
Pôster	7 (4,8)
Triamex	5 (3,4)
Sanson	3 (2,1)
Boral	2 (1,4)
Sitraq	2 (1,4)
Atanor	1 (0,7)
Plenum	1 (0,7)
Herbi-D	1 (0,7)
Gramoxone	1 (0,7)
Insecticide*	90 (90,0)
Karate	41 (31,5)
Orthene	36 (27,7)
Talstar	21 (16,2)
Confidor	15 (11,5)
Actara	6 (4,6)
Talcord	3 (2,3)
Engeo Pleno	2 (1,5)
Lorsban	2 (1,5)
Evidence	1 (0,8)
Vertimec	1 (0,8)
Decis	1 (0,8)
Cipermetrima	1 (0,8)
Fungicide*	38 (38)
Rovral	15 (28,3)
Does not remember	7 (13,2)
Infinito	6 (11,3)
Ridomil	6 (11,3)
Dithane	4 (7,5)
Opera	3 (5,7)

(To be continued)

(Continuation)

Variable (n = 100)	n (%)
Fungicide*	38 (38)
Priori	3 (5,7)
Cercobim	3 (5,7)
Cobre Sandoz BR	2 (3,8)
Manzate	2 (3,8)
Supera	1 (1,9)
Nativo	1 (1,9)

* Multiple answer
Source: Research data.

DISCUSSION

Tobacco cultivation is an exclusively rural activity mainly held by small farms, developed in a family farming system and transmitted from generation to generation.² Concerning the time of tobacco cultivation, similar data pointed out that families worked in tobacco farming for over 14 years.¹³

Regarding the application of pesticide products, similar percentage was found among fruit growers in the city of Bento Gonçalves, Rio Grande do Sul, of 19.4%,²⁶ and Maringa, Paraná, of 17.1%.²⁷ Regarding intoxication, studies state that tobacco growers from Santa Cruz do Sul, Rio Grande do Sul and Sombrio, Santa Catarina had been victims of episodes of acute intoxication or knew someone who suffered intoxication.^{19,28}

In another study of tobacco growers involved in the application of pesticides during the tobacco harvest in two districts of Swabi, Pakistan, blood collection data for analysis of levels of plasma cholinesterase (PChE) found that 58 (55%) of PChE levels were normal, 35 (33%) presented mild intoxication and 12 (11%) presented moderate intoxication.²⁹ It was observed symptoms like headache, dizziness, vomiting, shortness of breath, muscle weakness and skin rashes during and after spraying pesticide in tobacco cultivation.²⁹

The most reported symptoms of poisoning among tobacco growers in this study are similar to those reported by other growers, such as headaches (60%), nausea and stomach ache (30%) and poisoning requiring hospitalization resulting from the use of pesticides (10%).⁵

Among rural workers, the complaint after the use of pesticides included dizziness, headache, salivation, itchy throat, itchy or burning skin and nausea,²⁷ as well as stomach ache.²¹

Exposure to pesticides in large doses for a short period causes acute effects, ranging from mild to severe intensity, and characterized by nausea, vomiting, headache, dizziness, salivation, sweating, disorientation, paresthesia, skin and mucosal irritation, abdominal cramps, weakness, muscle fasciculation, difficulty to breath, cardiac arrhythmias, bleeding, convulsions, coma and death.³⁰

Chronic effects, on the other hand, are related to exposures for long periods and at low concentrations,

manifesting through numerous diseases that affect the human body and cause immunological, hematological and genetic modifications, congenital malformations and neoplasia, as well as disorders of the nervous, respiratory, cardiovascular, genitourinary, gastrointestinal, liver, reproductive and endocrine systems, skin and eyes. Moreover, effects include behavioral changes that may develop into anxiety disorders, depression and even suicide.^{5,15,31}

Exposure to chemicals and pesticides is one of the potentially associated conditions for the development of cancer because of their possible role in substances able to alter the DNA of a cell.³²

The results of this study, in addition to bibliographic review, demonstrate that the symptoms of intoxication among tobacco growers is a reality that compromises the health of these workers. The damage is not always perceived, or its occurrence is underrated. Therefore, it is important to health professionals, especially nurses, to identify the most common causes, and to plan and act in order to minimize the problem with health promotion, protection against occupational hazards and accidents, prevention of poisoning and epidemiological surveillance measures.

Regarding the use of PPE, the results indicate that most growers do use overalls, gloves, mask, apron, boots, face shield or goggles. However, they do not use all the equipment at once as the recommendations for their protection against exposure to pesticides.

Study revealed that all tobacco growers were using PPE and the most used were hat (98.1%), boots (94.2%), gloves (54.8%), mask (29.8%) and sneakers (5.8%) instead of boots. The most used clothing were pants (91.3%), long-sleeved shirt (64.4%), short-sleeved shirt (35.6%) and shorts (8.6%).³³ These results speak against the claim that they all use PPE, unveiling the risk to which these workers are exposed.

A study of rural workers in a city of the state of Espírito Santo showed that 60% of individuals used EPI.³⁴ Another study of rural workers of Rio de Janeiro revealed that 70% use PPE, though not always appropriately or sufficiently for protection against chemical agents, such as using only boots and hat.³⁵

It was evident in another study that PPE do not have good acceptance among growers because of the discomfort, causing suffocation feeling, intense heat and shortness of breath.¹³ It is important to highlight that families using pesticides are vulnerable to poisoning, so the use of suitable PPE reduces this risk. A study with Pakistan growers showed that most of them reported not using any PPE while handling pesticides.²⁹

A study of tobacco farmers in the municipality of Pelotas, Rio Grande do Sul, identified poor acceptance of the use of PPE due to discomfort while performing activities, including suffocation feeling, heat, shortness of breath, facts that can be justified since much of the work is performed during summer. In addition, companies have a tendency to only offer protection equipment, not taking into account that it

needs to be appropriate and comfortable for workers in order to be effectively used.¹³

The use of pesticides has been observed in other similar studies of the same population, being 100% and 94.2% respectively.²⁷⁻²⁸ In another study, 60% of respondents said they use pesticides in agriculture for pest control purposes, thus increasing production, and because of family tradition.³⁴ The use of pesticides is part of farmers' life, who believe these products are essential to the production of the farming.³⁶ In addition, the authors concluded³⁷ that in order to meet the world's need for food, production has become large-scale, requiring the use of chemicals in agriculture and unprepared workers to handle pesticides.

With respect to pesticides, the study participants reported to use it, regardless of the type of crop. Among the chemical group of pesticides most commonly used in this research are the pyrethroids, organophosphates, carbamates and dithiocarbamates, responsible mostly for causing damage to the central and peripheral nervous system. These results were also identified among Malaysian tobacco farmers exposed to such substances, whose nerve conduction velocity and postural oscillations appeared to be a sensitive indicator of the effects of pesticides.³⁸

Regarding the toxicological group, most products used by growers do not belong to the type I, or highly toxic group. A survey found that 8% of pesticides used on crops are extremely toxic (class I), 17% are highly toxic (class II), 50% moderately toxic (Class III) and 25% low toxicity (Class IV).³⁴ Although tobacco growers do not use only products with toxicological classification of the type I, it does not mean that the ones used are not harmful to health, because any level of toxicity is harmful to health.

The Roundup, an herbicide, has as active ingredient the glyphosate, substance that may cause dermatological problems; the Gramoxone, also an herbicide, can cause liver and kidney damage and irreversible pulmonary fibrosis; the insecticide Decis, from the pyrethroid chemical group, can cause eye irritation, skin allergies and asthma, among other diseases.³⁴

In addition, the Orthene, of which the active ingredient is the acephate, may cause damage in fetuses and neurological, immune, reproductive and endocrine systems. Thus, it was banned in countries like China, Pakistan, Indonesia, Japan, Ivory Coast, Samoa and European Community. In Brazil, in 2009, the National Health Surveillance Agency (ANVISA) has banned its use in peanut, potatoes, broccoli, citrus, cabbage, cauliflower, carnation, chrysanthemum, beans, tobacco, melons, peppers, cabbage, rose and tomato crops. However, after assessing the toxicological dossier, the decision was for the restriction of its use, and it can be used in all cultures that are indicated for.³⁹

CONCLUSION

The results reveal that most tobacco growers are exposed to pesticide products but report to use PPE. However, when analyzing the results it is clear that they use PPE in a fragmented way, being exposed to pesticides and more susceptible to health problems.

The tobacco growers report that they receive guidance on the use of pesticides, but the weather conditions along with the inadequacies of PPE contribute to the fact that its use does not occur effectively. Therefore, a greater number of scientific studies in the region is necessary to identify strategies that could be used to adapt the PPE to the climate and thus motivate the growers to use it correctly in order to protect their health.

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Received on: 23/02/2016
Reviews required: No
Approved on: 15/06/2016
Published on: 10/04/2017

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