Chapter 28

Qualitative evaluation of water origin and types of fertilizers used in vegetable cultivation in the Serra Geral region, Northern Minas Gerais

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ABSTRACT
Vegetables are a category of vegetables that includes vegetables grown in vegetable gardens, where parts such as roots, stems, leaves, flowers, fruits and seeds, are consumed by humans as food. Its consumption is extremely important for a healthy diet, because it has significant amounts of vitamins and minerals that, together with the medicinal properties that many have, help regulate and maintain the proper functioning of the body (MAKISHIMA et al., 2010).

Keywords: Horticulture, water, biofertilizers, natural insecticides

1 INTRODUCTION

Vegetables are a category of vegetables that includes vegetables grown in vegetable gardens, where parts such as roots, stems, leaves, flowers, fruits and seeds, are consumed by humans as food. Its consumption is extremely important for a healthy diet, because it has significant amounts of vitamins and minerals that, together with the medicinal properties that many have, help regulate and maintain the proper functioning of the body (MAKISHIMA et al., 2010).

The Serra Geral region, located in the North of Minas Gerais, is an important center of fruit production and has been a reference for consolidating with new cultivation technologies (MINAS GERAIS-MG. IMA, 2020). In addition to fruit growing, vegetable production occupies a relevant space in regional agriculture and occurs mainly in family gardens, representing an important source of income (SÃO PAULO, 2013).

The quality of the water used in the gardens is extremely relevant, as it can bring technical problems in the irrigation system, besides interfering in the soil properties, as well as in the quality of the irrigated crop (FRAVET et al., 2007). In the Serra Geral Region, the water used in the planting of these gardens comes from artesian wells, the Minas Gerais Sanitation Company (COPASA) and the Gorutuba River, and stored in reservoirs for further distribution in the cultivation areas.

Another important factor to be analyzed in the gardens of the region is the use of chemical insums to control pests and diseases and plant nutrition, because these products can contaminate production, especially leafy vegetables that are consumed without cooking, in addition to existing water resources. Alternatively, the use of biofertilizers is a practice that has become increasingly frequent, bringing advantages such as low costs of obtaining, improvement in plant quality and soil physical structure, optimization of nutrient cycling and, consequently, environmental improvements in cultivation systems (SILVA et al., 2019).

In this context, this study proposes to evaluate qualitatively, through the elaboration and application of a questionnaire, the origin and type of treatment of water used in the irrigation of vegetables in the municipalities of Nova Porteirinha and Janaúba, in addition to the use of industrialized chemical insums, biofertilizers and natural insecticides applied in these plantations.

2 MATERIAL AND METHODS

The work was carried out in July and August 2020, through a qualitative research, where the main sources of water for vegetable irrigation and application of agricultural supplies were identified. Data collection occurred according to all safety protocols and guidelines of the Ministry of Health/COVID-19.

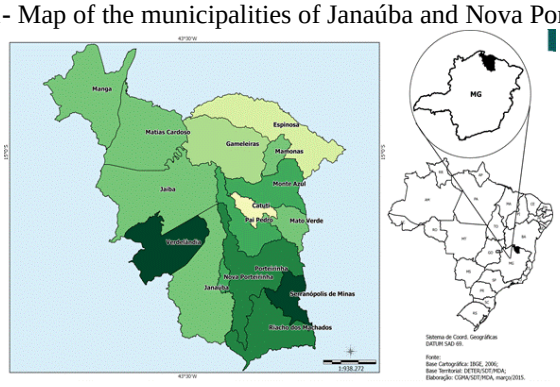
Twenty vegetable producers were interviewed, 10 from the municipality of Janaúba and 10 from Nova Porteirinha, and interviews were conducted through the delivery of questionnaires and telephone conversation, avoiding prolonged contact with the interviewees.

Study area

The survey was carried out in the municipalities of Janaúba and Nova Porteirinha (figure 1), through contact with farmers who have vegetable gardens on their properties.

Nova Porteirinha is situated at 518 meters of altitude, and has the following geographical coordinates: Latitude: 15° 48' 15" South, Longitude: 43° 18' 0" West. The municipality has fertile land, topography and climatic conditions favorable to various agricultural activities. After the construction of the Bico da Pedra Dam in 1979, located 5 km from the municipality's headquarters, the Gorutuba Irrigated Perimeter was implemented, located on the right bank of the river, occupying a significant part of the municipality area (almost five thousand hectares) and which plays a major role in the development not only of the municipality, but from all over the region (CTSR, 2015).

Figure 1- Map of the municipalities of Janaúba and Nova Porteirinha



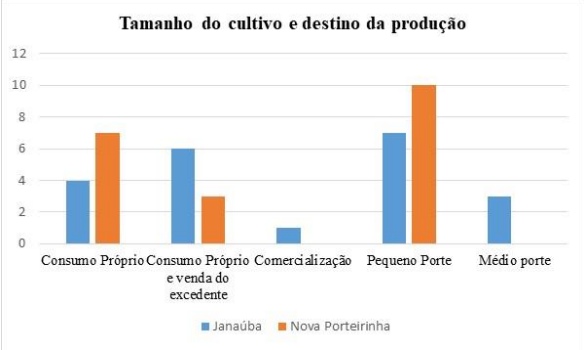
Questionnaire

For data collection, a questionnaire was elaborated with questions related to the origin and use of water in vegetable gardens in the municipalities of Janaúba and Nova Porteirinha, as well as questions about the use of pesticides and production destination

3 RESULTS AND DISCUSSION

Twenty vegetable producers were interviewed, and one of the questions was related to the destination of vegetables produced on rural property, whether they were marketed or only used for their own consumption. The size of the cultivated area was also evaluated, whether this was small, medium or large. The result is shown in graph 1.

Graph 1. Size of the cultivated area and destination of the production.



Translation:
Consumo próprio
Consumo próprio e venda do excedente
Comercialização
Porte pequeno
Porte médio

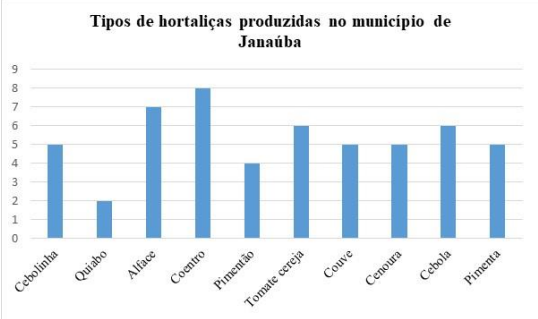
Tradução:
own consumption
Own consumption and sale of surplus
Commercialization
small size
medium size

The classification of the size of the cultivated area was carried out through the number of planted beds, up to four small beds, from 4 to 10, medium and above 10 large beds. After analyzing the results, it can be observed that in the municipalities of Janaúba and Nova Porteirinha the presence of large gardens are not common, which can be justified by the lack of market for the commercialization of these products,

in addition to the lack of incentive and technical assistance to small producers. Most horticulturales do not use the sale of products as a main source of income, but as a complement to family food.

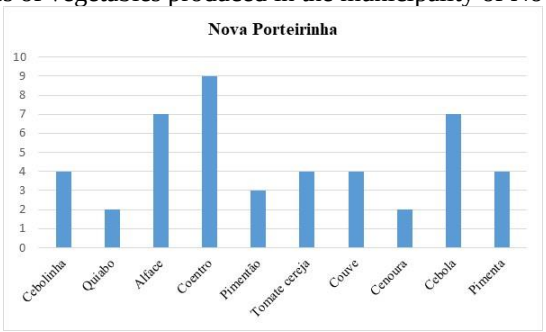
One of the questions to the producers was related to the type of species cultivated in the gardens. Leafy vegetables such as lettuce and coriander are the most found in the gardens of the municipalities of Janaúba (graph 2) and Nova Porteirinha (graph 3), which can be justified by the ease of planting and cultivation, in addition to the higher consumption by the population of the municipalities. Vegetable plantations such as peppers, tomatoes, broccoli and chuchu are less common in the region, because most vegetable gardens are small and the cultivation of these species would require a larger area and consequently greater investments. Another problem is susceptibility to diseases and pests as in the case of tomatoes, which would require stricter control and application of high-cost insums.

Graph 2: Types of vegetables produced in the municipality of Janaúba.



Translation:	Tradução:
Cebolinha	Scallion
Quiabo	Okra
Alface	Lettuce
Coentro	Cilantro
Pimentão	Pepper
Tomate cereja	Cherry tomato
Couve	Green cabbage
Cenoura	Carrot
Cebola	Onion
Pimenta	Pepper

Graph 3: Types of vegetables produced in the municipality of Nova Porteirinha.



Translation:	Tradução:
Cebolinha	Scallion
Quiabo	Okra
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Coentro	Cilantro
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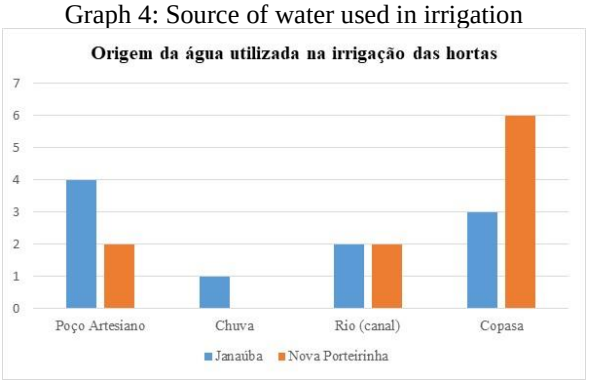
Couve	Green cabbage
Cenoura	Carrot
Cebola	Onion
Pimenta	Pepper

Graph 4 shows the result of the question about the origin of water used in the irrigation of planted areas, and most gardens located in the municipality of Nova Porteirinha use the water provided by COPASA (Minas Gerais Sanitation Company), treated respecting the potability parameters established by current legislation, but some properties use boxes for water storage for later use in irrigation.

According to GERMANO, (2003), water contamination can occur at the point of origin, during its distribution and, mainly, in private reservoirs, mainly caused by inadequate sealing of water tanks and cisterns, absence of regular and periodic cleaning and disinfection. During the research, the storage conditions of the water used were not evaluated, which should be done at a later stage, with the objective of making farmers aware of the importance of periodic maintenance in these places.

Graph 4: Source of water used in irrigation



Source of water used in garden irrigation

Translation:
Rio (canal)
Chuva
Copasa
Poço artesiano

Tradução:
river
Rain
Copasa
Artesian well

In the municipality of Janaúba, water from artesian wells is used more frequently, a common practice in the North of Minas Gerais, but in most properties, after the opening of the wells, an analysis of the quality of this water is not performed. According to Almeida, (2010) and Souza et al., (2016) groundwater is the ones that most face problems related to possible soil contamination, so knowledge of the physical-chemical quality of these waters becomes a necessary tool for planning the exploitation of this resource and for the management employed, when destined for irrigation, thus avoiding food contamination, problems with pumps, filters and emitters. The use of water from the Canal (Bico da Pedra Dam) and rain also does not undergo analysis or treatment, and a quantitative investigation of samples from these sources is necessary.

Vegetables have high nutritional value and have, for the most part, well-defined characteristics, such as: tender (non-woody) consistency, short biological cycle, requirement of intensive cultural treatments, cultivation in smaller areas (in relation to large crops), and use in human food still as raw, without requiring prior industrial preparation (CITTA, *et al* ., 2018). As in most crops, the emergence of diseases and pests is very common, which leads most producers to resort to chemical insums for the extinction or control of

them, however, when these compounds are used in excess they can cause serious problems of intoxication in the human body. An alternative to the application of pesticides is the use of biofertilizers, mixtures produced by farmers with insums found in the properties and simple preparation.

In the municipalities of Janaúba and Nova Porteirinha the use of biofertilizers has been practiced by most farmers (graph 5 and 6), especially those who cultivate smaller areas, the ease of preparation and low cost has been increasing the application of these products. Most of these small producers mentioned the need for more effective technical assistance, assisting in the correct preparation and application of these products.

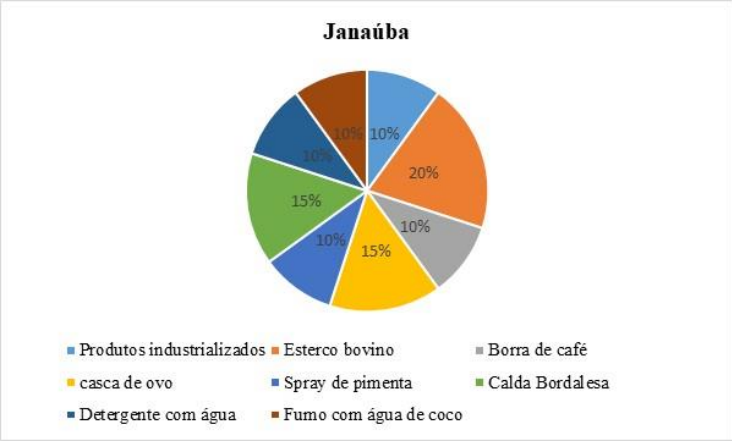
The biofertilizers and natural repellents most found were: bovine manure, eggshell, coffee grounds, pepper spray, mixture of smoke with coconut soap, bordalesa syrup (mixture of copper sulfate (II), virgin lime and water), bovine urine. In addition to biofertilizers and natural repellents, the use of industrialized pesticides was also reported in only three vegetable gardens located in the municipality of Janaúba, Among them were mentioned: Deltamethrin (structure similar to pyrethrin, classified as pyrethroid), Fiprofinil (active ingredient fipronil, insecticide and cupinicide of the chemical group pirazole, Malathion and Formocidol (whose active ingredient is Malathion), the use of these products can be observed due to the size of the cultivated area and the destination of production, i.e. they are producers who sell their products frequently, and production in greater quantity is necessary, where the number of pests and diseases also has a higher incidence.

Figure 5: Use of biofertilizers and natural insecticides in the municipality of Nova Porteirinha.

Translation:
Produtos industrializados
Esterco bovino
Casca de ovo
Detergente com água
Spray de pimenta
Borra de café
Calda bordalesa

Tradução:
Industrialized products
cattle manure
Eggshell
detergent with water
Pepper Spray
Coffee grounds
Bordeaux syrup

Figure 6: Use of biofertilizers and natural insecticides in the municipality of Janaúba.



Translation:
Produtos industrializados
Esterco bovino
Casca de ovo
Detergente com água
Spray de pimenta
Fumo com água de coco
Borra de café
Calda bordalesa

Tradução:
Industrialized products
cattle manure
Eggshell
detergent with water
Pepper Spray
Smoke with coconut water
Coffee grounds
Bordeaux syrup

4 CONCLUSION

With the qualitative survey conducted, it was observed that most producers do not perform the control of the quality of the water used in irrigation, many due to lack of guidance and technical assistance, and others because they do not deem necessary this type of procedure, which may compromise the quality and quantity of the food produced, besides damaging the equipment used to irrigate the area.

When it comes to the use of chemical supplies in planted areas, the use of natural products has been frequently used, which can be improved with guidance through extension courses and preparation of material that is easy to access and understand, since most producers do not have access to the Internet, or other means where much of these practices are disclosed.

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