ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 16, Issue, 01, pp.26901-26903, January, 2024
DOI: https://doi.org/10.24941/ijcr.46473.01.2024

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

PHYTOSANITARY DIAGNOSTICS FOR COTTONSEED PRODUCTION IN THE WESTERN ZONE OF BURKINA FASO

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ARTICLE INFO

Article History:
Received 19th October, 2023
Received in revised form
18th November, 2023
Accepted 15th December, 2023
Published online 19th January, 2024

Key words:
Diagnostic, Seed Production, Phytosanitary Products, Cotton Center.

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ABSTRACT

The cotton industry is a crucial component of Burkina Faso's economic development. However, despite the use of improved certified cotton seed and government subsidies on input prices, cotton production is decreasing. To address this issue, a phytosanitary diagnostic of cotton seed production was conducted in the Pa cotton-growing region. The aim was to identify the constraints faced by seed producers and propose sustainable solutions to improve productivity and seed quality. For the study, a total of twenty producers of seed were sampled in fifteen Simplified Cooperative Societies of Cotton Producers (SCOOPS-PC) of the Pa cotton-growing area in Balé Province. The results indicated that 100% of seed producers use pesticides to control weeds and pests. The constraints to cotton seed production include the unavailability of some inputs and the abundance of weeds and pests. To ensure sustainable improvement in seed production and quality, seed growers suggested proposals and solutions. They recommended the timely provision of inputs and measures to control weeds and pests.

Citation: ***SANANE Inoussa, CISSE Aboubacar and BAZONGO. Pascal.*** **2024.** "*Phytosanitary diagnostics for cottonseed production in the western zone of Burkina Faso.". International Journal of Current Research*, 16, (01), 26901-26903.

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) cultivation is an essential element of Burkina Faso's strategy to reduce poverty (Vitale, 2018). It provides a source of livelihood for almost 10% of the country's population (IFDC, 2010). In addition to the direct income that it generates for producers, cotton cultivation also plays a vital role in the growth and development of cotton-producing regions (Zagbaï *et al.*, 2005; Edmond, 2015). The use of certified seeds has been shown to increase yields by about 40% (FAO, 1998). The improvement in cotton production could depend on better control of crop protection techniques. According to Sebego (2010), in 1985, Burkina Faso produced only 115,000 tonnes of seed cotton. This increased to 150,000 tonnes a decade later in 1995, but dropped to 75,000 tonnes in 2005 due to inadequate cultivation practices leading to a recurrent decline in yields (Pouya *et al.*, 2013). Current cropping systems face challenges such as low usage of suitable agricultural inputs due to their high cost (Traoré *et al*., 2007a), strong land pressure, and monoculture (Traoré *et al*., 2007b; Hermann *et al*., 2015; SILUE *et al*., 2020). These problems cause a decline in cotton production despite research support. Pest infestations still pose a threat to cotton farms in Burkina Faso, while the use of phytosanitary products remains a controversial issue. Additionally, the role of improved seeds in cotton production is not well understood, which raises concerns regarding the sustainability of cotton production. Therefore, it is necessary to propose systems that allow for the use of improved seeds to ensure the sustainability of cotton production.

This study aims to contribute to a better understanding of phytosanitary protection for cotton seeds to enhance the sustainability of cotton production systems in Burkina Faso.

MATERIAL AND METHODS

Overview of the study area: The Pa cotton-growing area is located in the province of Balés and is crossed by national road N°1. It includes the entire rural commune of Pa, which comprises eight villages - Pa, Boro, Heredougou, Koupelin, Yamané, Didio, Kopoye, and Voho. Pa is the capital of the rural commune and is bordered to the north by Bagassi, to the east by Boromo, to the south by Founzan, and the west by Houndé and Boni. The survey sites were chosen based on the cotton-growing experience of the producers.

Methodology

This study involved both male and female cotton seed producers, although there were very few women participating. A total of 20 producers were selected for the 15 Simplified Cooperative Societies of Cotton Producers (SCOOPS-PC), with seed producer groups and cotton promoters on a random basis. The selection took into account the producer's experience in cotton planting and the nature of the cotton seed. A semi-structured questionnaire was given to the selected farms, which was pre-tested with 5 seed producers from the Pâ terroir before being administered to the entire sample. The questionnaire covered several aspects, such as knowledge of seed acquisition, seed quality, proposals, suggested solutions, and opportunities.

The interview was conducted in two stages: first, an interview with all members of the farm under the direction of the farm manager, and second, a field visit to the cotton plot.

Data analysis: The information gathered during the survey was analyzed using descriptive statistics in Microsoft Excel 2016. We expressed quantitative data such as weeding dates, pest numbers, and cotton diseases in percentages. Similarly, we expressed qualitative data like seed growers' opinions on difficulties and proposed solutions as percentages as well.

RESULTS

Weed management: Table1 presents two methods of weeding - mechanized weeding (using tools) and chemical weeding (using herbicides). The first weeding session was conducted by seed growers in the following ratios and at the given times: 20% of seed growers did it on 15 DAR and 80% on 20 DAR. The second weeding is performed by 40% of seed growers at 30 DAR, and 60% at 40 DAR. Regarding ridging, 15% of seed growers do it between 40 and 45 DAR, 70% do it between 45 and 60 DAR, and 15% do it beyond 60 DAR. 100% of seed growers use pre-emergence herbicides, 50% use post-emergence herbicides, and 20% use total herbicides. post-emergence herbicides and 20% of seed growers use total herbicides.

Phytosanitary protection cultivation

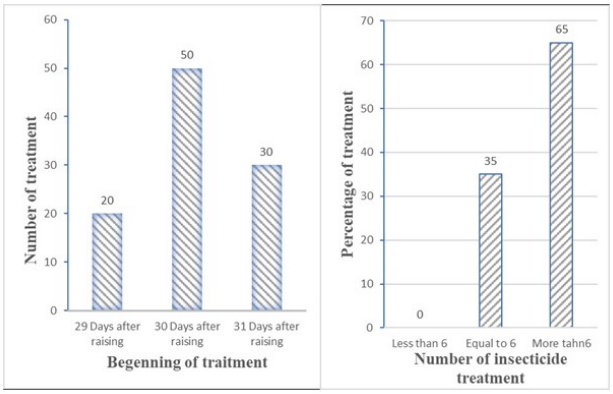

Figure 1. Beginning number of phytosanitary treatments

Figure 1 provides information on how frequently insecticide treatments are required. According to a survey, 50% of seed growers perform the first treatment 30 days before the harvest, 30% after 30 days, and 20% before 30 days. In terms of the number of treatments, 65% of seed growers carry out more than six treatments, while 35% limit themselves to six treatments.

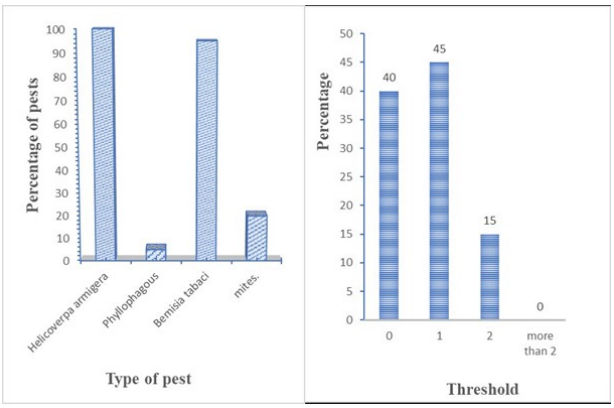

Figure 2. Pest types and attack thresholds

Figure 2 presents the frequency of pests and attack thresholds observed in the survey of seed companies. The survey found that all the seed companies observed carpophagous caterpillars (*Helicoverpa armigera*), and 95% of the companies observed sucking biters (*Bemisia tabaci*). Additionally, 20% of the companies observed mites. Regarding pest thresholds, 40% of the seed growers did not observe any, while 45% observed a single threshold for carpophagous caterpillars. Moreover, 15% of the seed growers observed two (02) thresholds for carpophagous caterpillars. Similarly, 40% of the seed companies did not observe any pest thresholds, whereas 45% observed a single threshold for carpophagous caterpillars, and 15% of the seed companies observed two (02) thresholds for carpophagous caterpillars.

Cotton diseases: According to the survey of seed companies, Figure 3 displays the most common diseases found on cotton plants. Phyllody was observed by 15% of the surveyed companies, while reddening with drying of the cotton plants was reported by 5%, and Macrophomina by 10%. However, it was found that 70% of seed growers did not observe any disease.

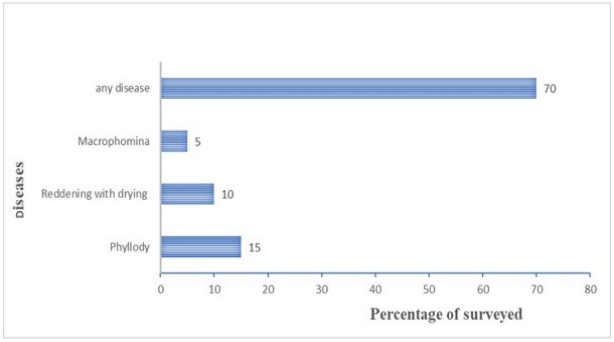

Figure 3. Diseases found on cotton plants

Difficulties encountered: Through discussions with various stakeholders, it was identified that there are several challenges in cotton seed production. These challenges include the selection of seed growers and their plots, monitoring from the supply of inputs to the planting of seedlings and the management of weeds and pests. A majority of seed producers (65%) find that the number of insecticide treatments of cotton plants is high, 40% of seed producers find insecticides to be ineffective, and all of them (100%) are concerned about the lack of personal protective equipment.

Proposed solutions: During the interviews with stakeholders, several suggestions were put forward to SOFITEX and the State to find palliative measures for the difficulties encountered during seed production. Implementing these suggestions could lead to sustainable production of quality seed and minimize costs. With regards to pest management, 15% of seed growers would like to see a return to genetically modified cotton. 80% of them would like to receive training or refresher courses on the safe use of insecticides, and 60% would like to have individual protective equipment.

DISCUSSION

All seed growers in the cotton center of Pa use herbicides to control weeds. These herbicides are used before and after sowing, and even during the seedling phase of the crop. This widespread use of herbicides is due to the diversity of the flora and the significant impact of weeds (Marnotte, 2000 ; Mick *et al.*, 2015).

Moreover, various types of herbicides are available at reasonable prices, and their use saves seed growers time, reduces labor costs, and, most importantly, improves yields. These findings are supported by research conducted by Kabore (2014), who demonstrates that growers in Burkina's western cotton zone use total herbicides before and after plowing, combined with pre-emergence herbicide, to decrease the workload and avoid bottlenecks. Half of the seed growers (50%) initiate their first insecticide treatment on plate number one.

Tableau 1. Weeding and ridging dates

1st weeding start date			
Days after raising	**15 DAR**	**20 DAR**	**More than 20 DAR**
Producer frequency (%)	20	80	0
Date of second weeding			
Days after raising	**30 DAR**	**40 DAR**	**More than 40 DAR**
Producer frequency (%)	40	60	0
Buttage start date			
Days after raising	**40-45 DAR**	**45-60 DAR**	**More than 60 DAR**
Producer frequency (%)	15	70	15
Herbicide types	Total	Pre-raising	post-raising
Producer frequency (100%)	**20**	**100**	**50**

Compliance with this deadline for the start of insecticide treatment could be attributed to the availability of insecticide products and the high level of pest pressure (*Helicoverpa armigera*) observed in 1996 and 1997. To prevent and manage *Helicoverpa armigera* resistance to pyrethroids, a regional program was launched in West Africa in 1998, which led to the development of the PR-PICA (2001) calendar treatment window program. However, some growers do not respect the 30-day deadline for the first insecticide treatment due to the difficulties of installing seedlings and the bottleneck of the various cultivation activities. Failure to comply with the recommended technical standards for plant health protection encourages the establishment of cotton pests, as plate plate number one corresponds to the persistence of seed treatment products (fungicides) and the start of the initiation of cotton flower buds, which need to be protected against pests, particularly the most dreaded *Helicoverpa armigera*. As the pests become established, control becomes more complicated, and this could be a source of contamination for other plots, leading to yield losses PR-IPCA (2015).

CONCLUSION

The aim of this study was to contribute to a better understanding of the phytosanitary protection of cotton seeds to ensure the Sustainability of production systems in Burkina Faso. The results of this study showed that all seed producers use pesticides to control weeds and pests. Constraints to cotton seed production include the abundance of weeds and pests. The proposals and suggestions for solutions put forward by seed producers to improve seed production and quality are, in order of importance, the availability of inputs and the training of seed producers in good agricultural practices. It appears necessary to continue this study on seed production, to propose a sustainable seed production system for each agro-ecological zone of the country.

ACKNOWLEDGEMENT

The authors are grateful to SOFITEX for its financial support to this study.

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