

**Pesticide use for management of aphids and viral diseases in passion fruit**Olango, A.<sup>1</sup>, Ochwo-ssemakula, M.<sup>1</sup>, Karungi<sup>1</sup>, J. & Sseruwagi, P.<sup>2</sup><sup>1</sup>Department of Agricultural Production, School of Agricultural Sciences, Makerere University,  
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**Abstract**

Passionfruit viral pathogens limit passionfruit production and are non-persistently transmitted by aphid vectors, the diseases can reduce orchard life span to only a year resulting to 100% yield loss. 50-100% loss due to biotic stresses has been reported in Kenya. A survey was conducted in Uganda, among passionfruit farmers in the six major passionfruit growing districts in 2012, to determine; types of pesticide being used, methods of pesticide application and their application regimes, level of control success, knowledge of passionfruit production, and challenges faced. 120 farmers were selected, consisting of a total of 10 current passionfruit farmers and 10 former passionfruit farmers from each district. Results indicated that pesticides are readily available and widely used in passion fruit farms, (71%) of the respondents were Male and 28% female between the age of 18 - 80 years with a median age of 30. It was further revealed that 50% of Ugandan passion fruit farmers use, or have ever used pesticides for controlling passion fruit virus vectors, of which, 31.2% of them have ever used "Rocket" (Profenofos 40% + Cypermethrin 4%) being the most commonly used pesticide. The main source of information on pesticide use was from fellow farmers (54.5%). The data and information generated provided critical baseline information for use in assessing the efficacy of pesticide being used by farmers against aphid vector(s) and associated passion fruit viral diseases, this revealed a critical need to create an appropriate framework to share knowledge for collective intelligence.

Key words: Efficacy of pesticide, types of pesticide, pesticide application, Uganda

**Résumé**

Les pathogènes viraux du fruit de la passion limitent la production de la passion et ce sont de non-persistante transmis par les vecteurs de pucerons, les maladies peuvent réduire la durée de vie de verger à seulement un an, avec pour conséquence la perte de 100% de rendement. La perte de 50-100% due aux stress biotiques a été signalée au Kenya. Une enquête a été menée en Ouganda, parmi les agriculteurs des fruits de la passion dans les six principaux districts producteurs en 2012, afin de déterminer les types de pesticides utilisés, les méthodes d'application des pesticides et de leurs régimes d'application, le niveau de succès de la lutte, la connaissance de la production du fruit de la passion, et les défis à relever. 120 agriculteurs ont été sélectionnés, comprenant un total de 10 agriculteurs de fruit de la passion actuel et 10 anciens producteurs de fruit de la passion de chaque district. Les résultats indiquent que

les pesticides sont facilement disponibles et largement utilisés dans les fermes de fruits de la passion, 71% des répondants étaient de sexe masculin et 28% de femme, l'âge varie entre 18 – 80 ans, avec un âge moyen de 30. Il a également été révélé que 50% d'agriculteurs ougandais de fruits de la passion utilisent, ou ont déjà utilisé des pesticides pour lutter contre les vecteurs du virus de fruits de la passion, parmi lesquels 31,2% d'entre eux ont déjà utilisé «Rocket» (Profenofos 40% + Cyperméthrine 4%), étant le pesticide le plus couramment utilisé. La principale source d'information sur l'utilisation des pesticides venait des collègues agriculteurs (54,5%). Les données et les informations générées ont fourni des informations de base essentielles pour l'utilisation dans l'évaluation de l'efficacité des pesticides utilisés par les agriculteurs contre le vecteur puceron et les maladies virales associées de fruit de la passion. Ceci a établi un besoin essentiel de créer un cadre approprié pour partager les connaissances de l'intelligence collective.

Mots clés: l'efficacité des pesticides, les types de pesticides, l'application de pesticides, l'Ouganda

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## Introduction

Passion fruit (*Passiflora edulis* Sims.) is an important crop targeted towards enabling over 50,000 small fruit farmers in Uganda and Kenya to increase their productivity and double their incomes by 2014 (TechnoServe, 2010). However, Viral diseases are a major limiting factor to passionfruit production worldwide (Moreira, 2008). These viruses are a potential threat to passionfruit production in Uganda. In areas where passion fruit woodiness disease (PWD) is prevalent, the disease can reduce the orchard life span to only a year resulting to 100% yield loss (Trevisan *et al.*, 2006). 50-100% loss due to biotic stresses has been reported in Kenya (Wangungu *et al.* (2010).

The diseases are widely spread in all passionfruit growing regions reducing fruit yield and quality. Diverse expressions of the viral diseases have been reported (Ochwo-Ssemakula, 2008) and linked to a single and novel predominant potyvirus tentatively named the “Ugandan *Passiflora* potyvirus” (Ochwo-Ssemakula, *et al* 2012), but also referred to as the *Passiflora* chlorotic mottle virus (DSMZ, 2012). These viruses have no cure, and can also be transmitted by grafting and mechanical inoculation (Fischer and Rezende, 2008). Elsewhere, several methods have been used to manage these diseases including: pesticides, biological control agents, cultural methods (Palumbo *et al.*, (2001), use of resistant varieties (Trevisan *et al.*, 2006) use of disease-free planting material (ADC/IDEA., 2002) with little or no success. While these chemicals reportedly yield beneficial results in management, their effect in managing diseases vectored by pests such as aphids is not clear. The application schedules are also quite diverse and could, in cases of the higher extremes, cause environmental pollution. There is, therefore, need to establish the facts on pesticide use, and loop holes in the practice, for integrated management of viral diseases in passion fruit.

## Literature summary

Viral diseases in passion fruit worldwide are transmitted by pest vectors prominent among which are aphids, white flies and nematodes (Koenig and Fribourg; 1986). Research has so

far shown that the passion fruit viral diseases are caused by a single, prevalent *potyvirus* (Ochwo-Ssemakula, 2008) although efforts to identify its vector have so far been futile.

Viruses belonging to the genus *Potyvirus* are naturally transmitted by several species of aphids (Hander *et al.*, 1993) such as; the green peach aphid (*Myzus persicae*), cotton aphid (*Aphis gossypii*), spirea aphid (*A. spiraecola*), and brown citrus aphid (*Toxoptera citricidus*) (Altfeld and Stiling; 2006). These aphids transmit the viruses in a non-persistent manner, although disease spread through grafting and mechanical inoculation is also possible (Fischer and Rezende, 2008). In Taiwan, annual replacement of diseased plantings with virus-free seedlings has been used, with limited effect (Chang *et al.*, 1992). Host resistance has been attempted with not much success due to resistance breakdown (Novaes and Rezende 2003). Several methods have been used to manage these diseases including: pesticides, biological control agents, cultural methods (Palumbo *et al.*, (2001) and the use of resistant varieties (Trevisan *et al.*, 2006). The use of resistant varieties is the most economical, efficient and environmentally friendly approach to management of viral diseases in passion fruits (Alfenas *et al.*, 2005, Trevisan *et al.*, 2005). However, there are no commercial passion fruit varieties which have been found to be resistant to all the viral diseases. Cultural practices such as barrier cropping, mulching and weeding which manipulate the cropping environment have been used to reduce the rate of viral disease incidence and dissemination (Hein, 2003). Plastic mulch has also been employed to reduce aphid vector infestation and associated plant viruses in various crops (Brown *et al.*, 1993; Summers and Stapleton 1998; 1999; 2002). Unfortunately these practices have not yet been successfully used against aphids related to passion fruit viral disease. These non-chemical control methods, however, keep aphid populations below economic injury level although, in cases of population build-ups, chemicals are often used (Avila, 1992). Benefits have also been reported following the use of chemicals in management of vectors of viral disease once in a disease free field (Chan and Jeger, 1994; Perring *et al.*, 1999). Passion fruit farmers in Uganda use chemicals to control pests. While these chemicals reportedly yield beneficial results in management, their effect in managing diseases vectored by pests such as aphids is not clear. The application schedules are also quite diverse and could, in cases of the higher extremes, cause environmental pollution. There is, therefore, need to establish cost-effective pesticide application schedules that also draw on non-chemical management techniques for integrated management of viral diseases in passion fruit.

### **Study description**

The study was carried out in 6 major passion fruit growing districts of Uganda in the year 2012 using questionnaires, consisting of both open ended and closed ended questions, these districts were, Buikwe, Jinja, Mbaale, Masaka, Buhweju and Kasese; Buikwe represented the central region, Jinja and Mbaale the Eastern, Masaka the Southern, Kasese and Buhweju the Western regions. 120 current and former farmers were randomly selected to achieve this; a multistage purposive sampling technique was used to select 20 villagers, from each major growing district, across at least 2 parishes. These groups consisted of a total of 10 current passionfruit farmers and 10 former passionfruit farmers. The current farmers were interviewed in their farms, for easy verification of information given.

Data was collected on; level of pesticide use, types of pesticide being used, methods of pesticide application, application regimes, level of control success, knowledge of passionfruit production, source of planting material, varieties grown, Challenges faced in passion fruit production; For the former farmers, why they stopped farming, control techniques attempted, among others. Data was entered in the Statistical Package for Social Scientists (SPSS) version 16 and analyzed.

### Research application

Challenges in passionfruit production, disease, mainly viral, remain the single most important challenge in passion fruit production in Uganda. (Fig. 1), this explains the reduction in

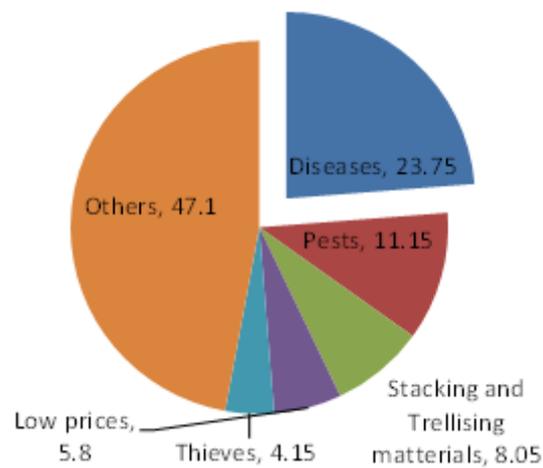


Figure 1. Major challenges being faced in passion fruit production.

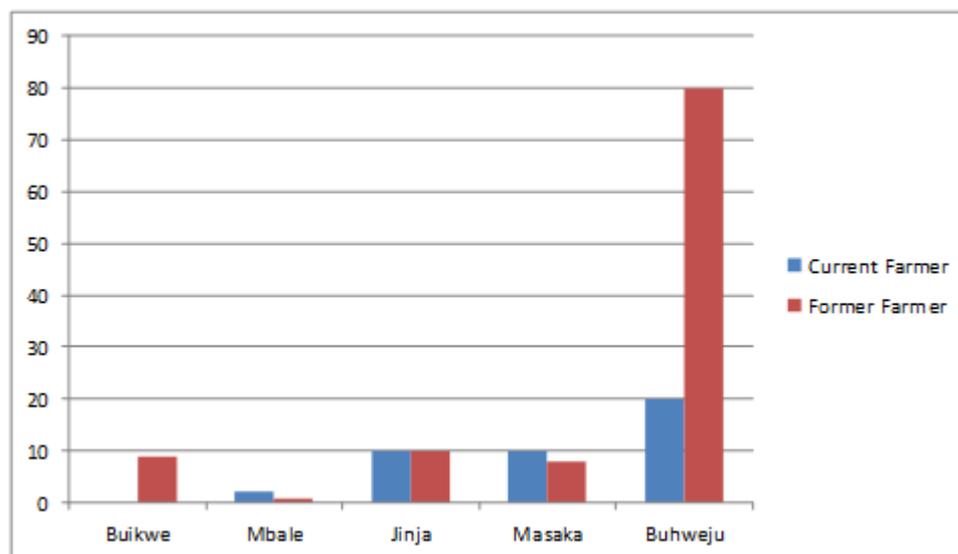


Figure 2. Comparing current and former farmers' percentage pesticide use.

production over the years. Other minor challenges include, land, soil fertility, drought, labour, and birds. Comparing the current and former farmers' pesticide use, current farmers are using less pesticides than the former, with only 50% usage as compared to 86.7% of the former farmers which shows 36.7% decrease in pesticide use (Fig. 2). The main passionfruit dealers (for export) seems to prefer organically grown fruits over those sprayed with synthetic pesticides, therefore forcing the current farmers to abandon, or not attempt the use of pesticides. Further information showed that many farmers have either abandoned passion fruit farming, or reduced the allocation of land for passion fruit production.

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