

Research Application Summary

**The use of *Crotalaria* species in sustainable management of plant-parasitic nematodes of vegetable crops in western Kenya**

Omami, E.<sup>1</sup>, Njira, P.N.<sup>2</sup>, Kipkoech, A.K.<sup>1</sup>, Ngode, L.<sup>1</sup>, Obura, P.<sup>3</sup>, Ndinya, C.<sup>4</sup>, Mbogo, M.<sup>1</sup>, Cheruyout, H.<sup>1</sup> & Ochuodho, J.O.<sup>1</sup>

<sup>1</sup>Chepkoilel University College, P.O. Box 1125-30100, Eldoret, <sup>2</sup>Moi University, P.O. Box 3900-30100, Eldoret, <sup>3</sup>AMPATH, P.O. Box 4806-30100, Eldoret, <sup>4</sup>Kenya Agricultural Research Institute, P. O. Box 169-50100, Kakamega, Kenya

**Corresponding author:** elizabethomami@yahoo.com

**Abstract**

The *Crotalaria* Project was funded by RUFORUM for two years starting October 2011. The overall objective of the Project is to increase production of vegetable crops through the use of cheap and sustainable nematode management strategies in smallholder farming systems. Plant-parasitic nematodes are the major production constraints in almost all vegetable growing fields in western Kenya. There is a growing demand for vegetables with World Health Organisation (WHO) recommending a daily consumption of 400-600g of vegetables, and even a higher daily consumption rate recommended to manage the deadly diseases such as HIV/Aids and malaria. However, the production of vegetables has not kept pace with the growing demand where the crop losses associated with biotic and abiotic factors of up to 100% has been reported. Nematodes alone have the capacity of causing huge losses by destroying vegetables' root systems thereby preventing water and mineral uptake from soil and by predisposing the plants to secondary infection by other pathogens like fungi, viruses and bacteria. The project seeks to come up with sustainable management strategies whose adoption by smallholder farmers would increase vegetable production. Sustainable nematode management strategies will be developed through this project whose implementation will increase the yield of vegetables.

Key words: *Crotalaria*, plant-parasitic nematodes, vegetables

**Résumé**

Le projet *Crotalaria* a été financé par RUFORUM pendant deux ans à partir d'Octobre 2011. L'objectif global du projet est d'accroître la production des cultures maraîchères par l'utilisation des stratégies de gestion durable et moins chère des nématodes dans les petites exploitations agricoles. Les nématodes phyto-parasites sont les principaux obstacles à la production dans presque tous les champs de culture des légumes

à l'ouest du Kenya. Il ya une demande croissante pour les légumes avec l'Organisation Mondiale de la Santé (OMS) recommandant une consommation quotidienne de 400-600g de légumes, et même un taux de consommation quotidienne plus élevé recommandé pour gérer les maladies mortelles telles que le VIH / sida et le paludisme. La production des légumes n'a pas suivi le rythme de la demande croissante là où les pertes de cultures, liées à des facteurs biotiques et abiotiques pouvant aller jusqu'à 100%, ont été enregistrées. Les nématodes à eux seuls ont la capacité de causer d'énormes pertes en détruisant les racines des légumes, empêchant ainsi l'absorption de l'eau et des minéraux du sol et en prédisposant les plantes à une infection secondaire par d'autres agents pathogènes comme les champignons, les virus et les bactéries. Le projet vise à élaborer des stratégies de gestion durable dont l'adoption par les petits agriculteurs accroîtrait la production des légumes. Les stratégies de gestion durable des nématodes seront développées grâce à ce projet dont la réalisation augmentera le rendement de légumes

Mots clés: *Crotalaria*, nématodes phyto-parasites, légumes

## Background

Vegetable production is carried out by almost all households in western Kenya for domestic consumption with incidental surplus for sale while a few farmers produce vegetable for commercial basis. Even with subsistence producers, vegetables are a major component in household decision-making and income equaliser. With vegetables forming part of every meal, the opportunity cost of not producing vegetables is high among farming households of western Kenya.

Members of the Project team conducted a field survey cum reconnaissance survey among the farming households of western Kenya. The survey was conducted in three counties namely, Kakamega, Bungoma and Busia where questionnaire was used to obtain information on vegetable production. The questionnaire was administered to 126 farmers. Preliminary results of the survey show that less than 10% of the vegetable farmers in the counties were commercial vegetable producers. All the households surveyed produced vegetables with indigenous vegetable of Solanaceous family, Spider, Pigweed and *Crotalaria* as the modal vegetables. Spider plant was most common in Kakamega and Bungoma while *Crotalaria* was most common in Busia.

## Literature Summary

Growing nematode-suppressive vegetables such as *Crotalaria species* in nematode prone agricultural fields can reduce nematode populations below economic injury levels. Most sedentary and some migratory endoparasitic nematodes are best controlled by this method. Typical example includes *Meloidogyne species* (Wang *et al.*, 2002). There are several mechanisms that *Crotalaria* species use to reduce plant-parasitic nematode populations. More often, these crop species are non-host or poor host to several plant-parasitic nematodes. They also produce allelochemicals that are toxic, inhibitory or sticky to nematodes. Examples of these compounds include pyrrolizidine, alkaloids and monocrotaline (Wang *et al.*, 2002).

## Study Description

The activities of the project include testing host suitability of various *Crotalaria species* to root-knot nematodes of vegetable crops and the efficacy of application methods of *Crotalaria species* in management of these nematodes. The recommendations of this Project are envisaged to provide solutions to the problem of nematodes through development of effective rotational programmes and farming practices to sustainably manage root-knot nematodes of vegetable crops. The Project collaborates with different institutions such as Kenya Agricultural Research Institute (KARI) and the Government ministries, to ensure that the research findings are disseminated beyond the Project period. In Kenya, these institutions are officially mandated to disseminate information from research institutions.

All the vegetables were selected through a destructive random sampling procedure. Also soil surrounding the sampled plants was picked to a depth of about 10 cm. All the plants selected were dissected in the field to see whether there was any evidence of attack by nematodes. While some plants showed obvious signs of nematode attack when they were dissected in the field, all the plants sampled were found to have been attacked by nematodes after extraction in the lab. This result has created a need to critically look at the nematode species in order to identify those that are currently harmful to the crops and those that pose high risks to the crop in future.

## Research Application

The results showed that even in fields where *Crotalaria* was intercropped with other vegetables, nematodes were still found yet, studies (e.g. Sikora and Fernàndez, 2005) shows that antagonistic plants such as *Crotalaria* ought to control nematode infestation. This results has helped to re-focus the project

*Omami, E. et al.*

because it is now clear that it is not *Crotalaria* per se that can manage the nematode infestation but rather a conglomeration of factors such as the dominant nematode species and whether it is susceptible to *Crotalaria* and the *Crotalaria* species that is used in the rotation. As suggested by Wang *et al.* (2002), field history, cover cropping system and edaphic factors may have significant influence on the efficacy of the *Crotalaria* for the control of nematodes.

### **Acknowledgement**

We thank the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) for funding this study.

### **References**

- Sikora, R.A. and Fernandez, E. 2005. Nematode parasites of vegetables. In: Plant-parasitic nematodes in subtropical and tropical agriculture 2<sup>nd</sup> edition. Luc, M., Sikora, R.A. & Bridge, J. (Eds). CAB international Oxfordshire, UK. pp. 319-392.
- Wang, K-H., Sipes, B.S. and Schmitt, D.P. 2002. *Crotalaria* as a cover crop for nematode management: A review. *Nematropica* 32: 35-57.