A REVIEW: BOTANICAL PESTICIDE AN ECOFRIENDLY APPROACH

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ABSTRACT

Current scenario depicts the loss of yield in agriculture production due to effective activity of harmful root knot nematodes. Among all the species of root knot nematodes, *Meloidogyne incognita* has examined as the most destructive nematode all over the world. Many complications have been highlighted by the usage of artificial pesticides due its negative impact on soil fertility and biological system. Alternative to artificial pesticides have been analysed in different plant species. Many plant species have nematocidal activity against RKNs. But still the best alternative is in search.

KEYWORDS: Artificial pesticides, *Meloidogyne Incognita*, Nematocidal Activity, RKN- Root Knot Nematodes

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INTRODUCTION

Synthetic pesticides have been shown to be very effective in eliminating plant pests and diseases, but they also pose a harm to the environment and human health (Sill, 1982). Occurrence of crop nematode problems has been increasing recently by modifying the cropping procedure in order to meet the increase in demand for food consumption worldwide (Yassin *et al.* 1992). Harm-full effect of the plant nematodes, specifically by root nematodes, leads to difficulty in the manufacture of a satisfactory nutrient supply (Carter and Sasser, 1982). Minute or no harm -full effect was noticed on non-targeted organisms by the selected natural products. Bhatti *et al.* (1994) proved that 30% of yield losses under field conditions is by *M. incognita*. This causes severe trouble for various annual and perennial crops. The favourable condition for the imitation and nourishing events of plant parasitic nematodes all over the year is achieved in a large tropical country named as Sudan (Elbadri *et al.* 2008). On every side of tropical places in the world, root knot nematodes (*Meloidogyne* species) have been known as the most copious and devastating nematode. These species are mostly parasitizing sum of plant species belonging to Families Cucurbitaceae and Solanaceae (Taba *et al.* 2008). These leads to yellowing of leaves and reductions in their growth and yield. Therefore, the typical signs are the formation of galls on roots due to the development of giant cells (Fig.1). All over the world crop yield losses have been exceeded by US\$125 billion (Chitwood, 2003). Nematicidal activities have been found in plant products of 57 different families (Sukul, 1992), (Latif *et al.* 2014). *Meloidogyne* spp., caused world-wide financial threat by the harmful effect in both humid and subtropical crop production regions (Sikora *et al.* 2005). About 200 plant species together with herbaceous and woody-plants of monocotyledon and dicotyledons are affected by this root parasitic nematode (Hussey, 1985). Almost 90% of damage is caused by *M. incognita* (Krechel *et al.* 2002). The most significant and agriculture efficiency and quality diminishing pathogens are the root-knot nematodes (*Meloidogyne* spp.) (Tylenchina: Meloidogynidae) (RKNs) amongst all plant-parasitic nematodes (Irshad *et al.* 2006), (Yen *et al.* 2004). *M. incognita* is the utmost pathogenic nematode, including Turkey, *M. incognita*, *M. arenaria* Chitwood, *M. javanica* (Treub) Chitwood and *M. hapla* Chitwood

commonly found in RKN species (Kepenekci *et al.* 2016).

Figure 1: Plant Showing Uninfected and Infected Root Phenotypes.

SIGNIFICANCES

Great contribution to nitrogen and phosphorus cycles and to soil fertility by the free living nematodes. Plant-parasitic nematodes for example

The bacterial, omnivorous, hyphal-feeding and predacious nematodes co-inhabit the loam (Ajitomi *et al.* 2017). Probably, these are present in different types of environment and free-living nematodes exist in the soil, fresh water, marine sands and muds. Nematodes have a significant niche in agro-ecosystem triggering reduction in plant productivity and growth (Azhagumurugan *et al.* 2013). In general, the chief allelopathic effect in flowering stage is seen in plants, so at that time nematotoxic compounds are produced in highest quantity (Ajitomi *et al.* 2017). Additionally, root knot nematodes in the presence of other biotic and abiotic stresses generate more complex contagium.

These aspects along with a high generative rate of the nematodes make it hard to achieve root knot parasitism (Latif *et al.* 2014). Impairment of microorganisms such as fungi, earthworms and bacteria and soil biomass is executed by pesticides. The Soil nutrient element cycle consists of soil organic matter such as microbial biomass. Mutilation of local metabolism and impression on non- target organisms are achieved by the usage of pesticides which are essential for soil fertility. It has been expected that the practice of pesticides in 2050 will be 2.7 times greater than in 2000. In the period of 2-20 years, a lot of new resistant cases have been stated. Even after the start of novel modules of insecticides like cyclodienes, formamidine, organophosphates, carbamates and pyrethroids. The dosage of pesticides was increased by times the amount added before due to the ineffectiveness in the pest resistance. Although the use of fungicides is to protect crops from diseases and insecticides are to kill pests of plants. A study exhibits that a type of commonly used (96%) pesticide by the farmers is known as Arjuna. It comprises an ingredient from the payroll group known as chlorfenapyr active compound. WHO declared it as the temperately hazardous insecticide (Joko *et al.* 2017). Mostly in the tropics and subtropics of many countries, a stern production loss is seen in a wide variety of crops (Sasser & Freckman, 1987; Luc *et*

al. 2005). Present supervision of nematodes is fixated on, cultural practices or chemical nematicides, crop rotation, plant resistance (Chitwood *et al.* 2002), (Kepenekci *et al.* 2016). The farmers are using huge quantity of pesticides once in every three or four days. About three insecticides and fungicides types are slightly combined around 30-40ml for each type. The land degradation potential was seen by the extreme usage of pesticides (Taniwiryono *et al.* 2009).

ALTERNATIVES

Artificial nematicides are one of the chief sources of control in strenuously full –fledged crops (Zuckerman and Esnard, 1994). A worthwhile key solution to the synthetic pesticides that creates environmental problems is being found out by the researchers (Park *et al.* 2005). An active protocol of pesticide discovery is seeing the possibility of plant secondary harvests being tangled in plant-pest relations, the tactic of casually isolating, recognizing, and bio-assaying these composites (Duke, 1990). Plenty of plants are found to be extremely impervious to plant pathogens, insect pests and plant parasitic nematode. For example, chrysanthemums (*Chrysanthemum* spp.), rattlebox (*Crotalaria spectabilis*), cinnamon (*Cinnamomum verum*), marigolds (*Tagetes* spp.), garlic (*Allium sativum*) and neem

(*Azadiracta indica*) (Satti and Naser, 2006; Elbadri *et al.* 2008; Kong *et al.* 2007; Park *et al.* 2005; Duke, 1990). Many chemicals were effectually used to decrease loss due to nematode parasitism (Abad *et al.* 2008). Many beneficial things have been found by the usage of different plant products against nematode parasitism, when related to methods like informal accessibility and applicability, cost effective, growing soil fertility and no harmful effects on the atmosphere (Kumar *et al.* 2005). Consumption of pesticides from plant origin, called as botanical pesticides. As they are already malformed by oxygen, microorganisms and light into less toxic products they are measured to be non-persistent beneath field environment. Thus, no deposits are predicted on the products or in the environment (Taniwiryono *et al.* 2009). Due to these limitations, studies show that natural compounds with nematicidal activity such as a plant extract, root exudates, plant volatiles etc. Sliced pine-apple (*Annanascomosus* (L.) Merr. (Poales: Bromeliaceae)) Leaves were used as an organic amendment against *Meloidogyne* spp., initiate to study the nematicidal effect by Linford *et al.* (1938). It was assumed that nematicidal compounds were present in several plant species, demonstrating 57 families together with Rutaceae, Asteraceae, Myrtaceae, Lauraceae, Lamiaceae (Andres *et al.* 2012; Sukul, 1992). Mediterranean coast is recently becoming the important site for research on the practice of plant extracts as a substitute to synthetic pesticides for RKNs resistance. (Bosselut *et al.* 2011; Andres *et al.* 2012; Kepenekci *et al.* 2016). For the production of innovative pesticidal compounds, plants produce chemicals that are the novel source of advance chemistry. Nematicidal phytochemicals are commonly safe for human as well as the environment (Chitwood *et al.* 2002). Nematicidal activity has been identified in plant essential oils, mainly monoterpenes. They were extremely active in the nematode destruction (Oka *et al.* 2000; Oka *et al.* 2006). There is still continuous usage of synthetic pesticides or soil fumigants instead of other methods like e.g. improving cultural practices, using natural enemies and growing resistant cultivators. Developing new alternatives for controlling nematodes is necessary due to the highlighted complications. One such promising strategy is the use of plant compounds for demolishing nematodes, as these are cheap, eco-friendly, easily available and have the strength to recover the cause (Liu *et al.* 2014).

CONCLUSIONS

The review exhibits the disadvantage of chemical pesticides on the environment. Still, there is a need for research to identify the best alternative for chemical pesticide such as botanical pesticide.

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