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DRESSING OF BANANA RHIZOMES FOR PROTECTION DURING CRITICAL GROWTH PERIOD

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A mixture of polyvinyl alcohol and *Tenekil* (polychlorinated petroleum hydrocarbon) in a ratio of 99:1 was used for dressing of banana rhizomes in order to provide them protection from the soil inhabiting plant parasitic nematodes during critical growth period.

INTRODUCTION

Records of nematodes attacking banana in Pakistan are only as old as 1962 when Brown [1] conducted a short survey of Pakistan. Naziruddin [2] considered nematodes as threat to banana industry. Saeed *et al.* [3] have attributed the losses caused by nematodes to the extent of 50%. They [4] have also reported the association of root-knot nematodes *(Meloidogyne* spp.) with banana relating their distribution with the river Indus. Maqbool and Sultana [5] studying the effect of chemicals on gall formation in banana have reported the efficacy of *Carbofuran* and *Aldicarb* against *Meloidogyne incognita*. Apart from these studies there appears to be no other reference to the control of nematodes in Pakistan. It is evident that a thorough study of the effectiveness of different control methods against a variety of both ecto- and endoparasitic nematodes is lacking.

Of the two major approaches of nematode control, viz. preventive and curative, the former is more economical and less hazardous since it mainly involves the disease escape, i.e., keeping the pest away from the plants or fields. The preventive measures are also more practicable and easily understandable to the common farmers of the developing countries. However, the most important thing is that preventive measures provide protection to plants during the early and essential period of development which is called the critical growth period. Protection of plants during this period has a long lasting effect on them because after this period generally the plants become relatively more tolerant to pathogenic disorders.

The relationship between the age and tolerance of plants to pathogenic disorders is very important and has been reported from diverse sources. Giddings [6] notes that the young sugarbeet plants show greater symptoms of injury to curly top virus than did the older ones. Dropkin [7] considered the age of the host as a predominant factor in infection and pathogenesis since *Meloidogyne* sp. attacks mostly young roots of the plants. Brodie and Cooper [8] noted the sensitivity of susceptible tomato to *Meloidogyne* spp. decreasing rapidly with increase in the age of plants. Fiedel [9] observed 24-48 hr. old onion seedlings to be more severely damaged by *Ditylenchus dipsaci* than those 72-96 hr. old. These studies show that plants are more susceptible to pathogens during the seedling stage. It is therefore imperative that methods should be devised to protect plants right from the beginning of their life cycle. We call this approach as PRIMARY PLANT HEALTH CARE and conducted experiments to provide protection to plants during the critical growth period. The present paper is the first of the series on Primary Plant Health Care and reports the results of an experiment in which a chlorinated petroleum hydrocarbon of indigenous origin named *Tenekil* (formerly *Petkolin*) was used to provide a protective dressing to banana rhizomes. Tenekil has 60-62% chlorine content, 0.3% acidity, 162 flash point and is non-toxic to plants upto 1%. Its mammalian toxicity is: oral LD 50 = 4245, dermal LD 50=9000 mg/kg. (10). *Petkolin* has already been established as an insecticide against sugercane pyrilla and sucking insects [11, 12, 13].

MATERIALS AND METHODS

A mixture of polyvinyl alcohol and *Tenekil* 95% E.C. in a ratio of 99:1 was prepared and eight banana rhizomes (William Hybrid variety) of 25 cm height raised in a naturally infested soil were placed in such a manner that they stood erect and 15 cm immersed in this preparation for 10 min. Later on, the rhizomes were removed, held over the container till the excessive liquid drained off and allowed to dry up under shed. Another set of eight rhizomes of the same height and size were taken as untrea-

ted control. When dry with a coating becoming visible, all the rhizomes i.e., dressed (treated) and not dressed (untreated) were transplanted in 30 cm dia. earthen pots filled with silty loam soil amended with farmyard manure and naturally infested with *Hoplolaimus indicus, Helicotylenchus microdorus, Tylenchorhynchus clavicaudatus, Paratylenchus* spp. and *Meloidogyne javanica* (larvae) with population levels of 135, 127, 75, 49 and 23 per 100 ml. of soil respectively. The pots were kept in a shed and watered with regular intervals. Soil samples were taken from two distances – 0 cm and 10 cm from the rhizomes after one, four and finally eight weeks when the plants were uprooted. A metallic auger was used for taking soil samples. The nematodes were isolated through modified Baermann's method and counted in a glass dish bearing ½ cm squares on the surface made with the help of a diamond marker. Care was taken to avoid contamination during soil sampling or nematode isolation and counting.

RESULTS

Population of *Hoplolaimus indicus, Helicotylenchus microdorus, Tylenchorhynchus clavicaudatus* and *Paratylenchus* spp. in the sample collected after one week at 0 cm distance (adjacent to rhizomes) in the treated sets was negligible, being 0, 3, 4, and 4 respectively as compared to 10 cm distance sample in which the corresponding numbers were 21, 20, 21 and 19 per 100 ml soil. These counts in the untreated sets were 127, 123, 63 and 21 compared to 129, 119, 73 and 23 nematodes respectively. After four weeks the 0 cm sample of treated sets yielded 5, 9, 9 and 17 nematodes in comparison to 35, 23, 34 and 36 in the 10 cm samples whereas in the untreated sets these numbers were 155, 131, 94, and 41 compared to 164, 141, 94 and 50 per 100 ml. soil respectively (Table-1).

After eight weeks average number of nematodes in treated sets was 22, 17, 22 and 32 in 0 cm sample and 45, 47, 42 and 51 in 10 cm sample whereas the corresponding numbers in the two untreated sets were 170, 185 and 149 and 61 compared to 175, 171, 106 and 87 nematodes per 100 ml soil correspondingly. When the plants were uprooted, none of the treated samples (0 and 10 cm) yielded galls of root-knot nematodes whereas the galls of *Meloidogyne javanica* were found in both the untreated samples after 8 weeks but, however, without any difference in the severity of infection. The average height of the treated plants was 60 cm as compared to 40 cm in control sets yielding an increase of 67% over untreated plants.

DISCUSSION

The results clearly show that the treated plants throve better than the untreated ones and this condition was associated with the difference in the number of parasitic nematodes between the treated and untreated sets. Again in the treated sets there was a marked difference between the samples collected from adjacent to the rhizomes (0 cm dis-

Table 1. Number of nematodes per 100 ml soil recovered from treated and untreated sets after 1,4 and 8 weeks

Nematode species	Treated sets						Untreated sets					
	0 cm distance			10 cm distance			0 cm distance			10 cm distance		
	1 WK	4 WK	8 WK	1 WK	4 WK	8 WK	1 WK	4 WK	8 WK	1 WK	4 WK	8 WK
Hoplolaimus indicus	0	5	22	21	35	54	127	155	170	129	164	175
Helicutylenchus microdorus	3	9	17	20	23	47	123	131	185	119	141	171
Tylenchorhynchus clavicaudatus	4	9	22	21	34	42	63	94	149	73	94	106
Paratylenchus spp.	4	17	32	19	36	51	21	41	61	23	50	87
Meloidogyne javanica (galls)	–	–	–	–	–	–	–	–	++	–	–	++

– = No galls

+ += Moderate infection

tance) and the ones collected from 10 cm distance. With the passage of time this difference narrows down but before this, protection to the plant during the first eight critical growth weeks had already been provided.

The concept of the critical growth period is a relative one. Seinhorst [14] has stated that "the plants may have more roots than they really need to support the amount of shoot they produce and not all the root tissues may be of equal importance to the plants. Then a certain amount of damage to the root tissues or the loss of a certain proportion of root does not result into reduced top growth." Now, since every portion of a seedling or a young plant is absolutely necessary for plant growth, it follows that the critical growth period is the period in plant life cycle when it does not have any extra root which it could afford to lose. Protection of plants during this period is necessary and the protective coating does this job most effectively as was evident from the faster growth of plants coupled with less number of nematodes in the dressed rhizomes as compared to those that were not dressed.

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