Utilization of Betel Leaf Extract as Botanical Pesticides to Control *meloidogyne spp.* and Tomato Plant Production

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Abstract. *Meloidogyne* spp. Are among the polyphagous pest that has spread around the world and has been reported to attack cultivated plants with economic values. Various ways had been applied to control the *Meloidogyne* spp. nematodes but has not yet showed any effective results. We are currently using synthetic pesticides because of its fast response and ability to maintain plant productions. The improper application of synthetic nematicides would have a negative impact on the environment. The aim of this research is to know the effectiveness of betel leaf concentration (*Piper betel* L.) to curb the development of nematodes on Root-Knot *Meloidogyne* spp and the growth of tomato plants. This is a descriptive research, with the utilization of betel leaf extract (*Piper betel* L,) by concentration treatment of 0 %, 5 %, 10 %, 15 % and 20%, each of which are repeated five times. Complete Random Sampling (CRS) with the F test is used and continued with the Duncan test at a 5 % rate. The result shows that the betel leaf extract of the 20% concentration was the most effective either on the growth of plants and to the root-knot nematodes. The suppression of growth in the ground was 80,06% and the lowest was recorded with the 5% concentration (2,32 %); the suppression of root-knot was 45,45 % while the lowest was with the 5% concentration (12,12 %); the suppression of nematodes population in the roots was 45,45 % while the lowest was with the 5% concentration (39,76 %); and last was the suppression of egg mass which was 61,73 % while the lowest was shown in the 5% concentration (18,32 %). It can be concluded in this research that the most effective betel leaf extract concentration was at 20%.

***Keywords*: *Meloidogyne* spp., *Piper betel* L., CRS**

I INTRODUCTION

There was a decrease in tomato plant productions from 647.020 tons in 2005 to 629.744 tons in 2006 [1]. One of the important pests causing the decrease of tomato production is the root-knot nematodes causing root ulcers, *Meloidogyne* spp. These nematodes have an important role in causing damage on the roots of horticultural plants, crops, plantation, and weeds [2]. The damage caused by *Melodogyne* spp. especially in tomato plants around the world is significant. *Meloidogyne* spp. are among the concerning pests due its polyphagous characteristic and its growth population has spread around the world [3].

The *Meloidogyne* spp. nematode attacks almost every vegetable plant and some plants can be attacked by more than one nematodes species. *Meloidogyne* spp. are spread all around the world and many have been reported to attack cultivation plants with economic values, serious losses could occur when plants are severely infested. Agrios (1969) stated that losses due to root-knot nematodes *Meloidogyne* spp. are variable depending on the type of plant being infested, the species of *Meloidogyne*, and the environment condition [4]. If young susceptible plants are infested, it would cause it to die, however if an adult plant are infested, it would have only a small effect towards the production.

From previous studies using many plant leaves extract as botanical pesticides, it is found that the use of betel leaf extract was the best way to suppress nematodes population, however it is not yet known the most effective concentration of its botanical use to control nematodes [5]. *Meloidogyne* spp. nematodes attack almost all vegetable plants and some of those plants can be attacked by more than one nematode species. *Meloidogyne* spp. are spread all across the world and have been reported to attacked many cultivation plants with economic values, of which severe losses can happen if the plants are severely infested. Agrios (1969) stated that the loss due to root-knot nematodes *Meloidogyne* spp. varies depending on the types of plants.

Various ways of controlling is applied towards root-knot nematodes *Meloidogyne* spp. which includes plantation of nematode resistant varieties, plant rotation, and technical culture, however these controlling methods is less effective to suppress *Meloidogyne* spp. population [6]. Until now, many farmers are still using synthetic pesticide on tomato plantation to control nematodes due

to its fast response and ability to maintain plant productions; however improper application of synthetic nematicides will have a negative outcome towards the environment. The purpose of this research is to know the effectiveness of the concentration level of betel leaves extract to suppress the development of root-knot nematodes *Meloidogyne* spp. in tomato plants, to know the development of tomato plants after being treated with betel leaves extract and also to know the result of tomato plant productions. The major purpose in this research is to support farming and to increase their family income, especially for tomato productions.

II RESEARCH METHOD

The research is conducted in an experiment garden of the Agriculture Faculty in conjunction with Laboratory of Pests and Plant Disease of Agriculture Faculty Udayana University, of which is a descriptive research which utilize piper betel leaf extract as treatment with the concentration of 0%, 5%, 15% and 20%. Each treatment is done with five repetitions which are given to tomato plants which have been infested with root-knot nematodes, *Meloidogyne* spp. This research uses a Complete Random Design (CRD) analyzed by F-test and continued with Duncan'N 0,05 (5%).

III RESULTS AND ANALYSIS

The research result shows that all treatment that was given had a real effect towards all changes that was observed. Towards the growth of plants, the concentration of betel leaf extract that was used, has given different effects on the changes observed, one of which the 20% concentration has given the best result towards plant growth compared to the other, while the growth is retarded with the usage of lower concentration. This result is supported by other studies conducted by Ambika and Poonima (2014) in India which states that treatments with Kirinyuh leaf extract applied into the soil of soy bean plantation can increase the height of the plant by 15 %, root length by 40%, and attached beans by 163%. Statistical analysis result showed real differences between treatment with 20% concentration compare with the controls and between treatments which had shown real differences presented in Table 1.

IV CONCLUSION

As for the nematodes population in the soil, the 20% concentration has had the biggest suppression at 80,06%, and the smallest was with the 5% concentration with 2,32%; as for the amount of root-knot, the 20% concentration suppression was 45,45% and lowest was with the 5% concentration at 12,12%; as for nematodes in the roots, the 20% concentration suppression was 76,14% and lowest was with the 5% concentration at 39,76%; and for the amount of egg mass with the 20% concentration suppression was 61,73% and lowest was with the 5% concentration at 18,32%. In this research, it has been concluded that the most effective concentration of betel leaf extract is 20%. Treatment applied for plant growth showed the best plant growth also occurred with the 20% concentration treatment while the least growth occurred with the 5% concentration treatment. From the result it can be concluded that the best concentration of betel leaf extract is with the 30% concentration.

Feedback:

1. Need to conduct further research in the field with the effective concentration (20%) with tomato plantation.
2. Needs to conduct further research with other types of plants and different types of nematodes; on different types of plants that are attacked by root-knot nematodes or parasitic nematodes

TABLE 1.
THE INFLUENCE OF BETEL LEAF EXTRACT APPLICATION IN VARIOUS CONCENTRATIONS TOWARDS SOME CHANGES.

No	Treatment	Plant Height (cm)	Root Length (cm)	Wet-root Weight (g)	Amount of Fruits	Pop. nem/ 300 g soil (each)	Root-knot/gr of root. (each)	Pop.nem /gr of root (each)	Amount of egg mass /r root (each)
1	Control	48,0 a	24,0 a	24,0 a	1,8 a	120,4 a	63,8 a	100,6 a	62,2 a
2	P. 5%	55,6 b (13,66%)	39,4 b (39,08%)	41,4 b (42,02%)	3,0 b (36,0%)	117,6 a (2,32%)	56,0 b (12,12%)	60,8 b (39,76%)	50,8 b (18,32%)
3	P. 10%	60,8 c (21,05%)	42,4 c (43,39%)	46,4 c (48,27%)	3,2 c (43,75%)	100,8 b (23,59%)	51,2 c (19,74%)	48,6 c (51,8%)	40,6 c (34,92%)
4	P. 15%	64,8 d (25,92%)	45,8 d (47,29%)	51.2 d (53,12%)	4,6 d (60,86%)	71,2 c (40,86%)	38,0 d (40,43%)	36,4 d 963,81%)	32,4 d (47,9%)
5	P. 20%	70,0 e (31,42%)	51,2 e (53,12%)	56,0 e (57,14%)	5,4 e (66,66%)	24.0 d (80,06%)	34,8 e (45,45%)	24,0 e (76,14%)	23,8 (61,73 %)

Note: Numbers of which are followed by different letters in the same columns has a result of significantly different at the level of testing with Duncan'N 5% (0,05)

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