Impact Of Different Time Planting In Soybeans And Neem Seed Extract Application To Insect Population On Rice Field

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Abstract: The purpose of research is to study impact of different time planting of soybean and neem seed extract application to pest insect population on rice field. The research was used Random Block Design in three treatment of insecticides application i.e: neem seed extract together with rice planting, neem seed extract on soybean 17 days after rice planting, synthetic insecticides on 17 days after rice planting (Delthametrin on soybean and Chlorpirifos on rice), respectively. Research was conducted in rice fields with irrigation channels. The land area is 0.8 hectares with extensive experiments each rice terraces approximately 900 m^2 with separate by rice terraces for every treatment. Each treatment consisted of three groups and using nine rice terraces. Samples of the rice plant population is 25 plants per sample unit. The results was showed treatment by neem seed extract with different time planting of soybeans able to reduce number of pest insects populations such as : *N. virescens* (80.38%) , *N. lugens* (67.17%), *S. incertulas* (66.5 %), and *L. oratorius* (93.46%) when compared to treatment with synthetic insecticides (Delthamethrin and Chlorpyrifos).

Keywords: soybean, rice, neem seed extract, pest population, Delthametrin, Chlorpyrifos

1 INTRODUCTION

Rice (Oryza sativa L.) is an agricultural important crop for half world population (FAO, 2004) [7]. Rice was growth approximately on 145 million hectare in 110 country (Pathak and Khan, 1994) [15]. About 90% rice were growth and consumption in Asia. Overall, rice to be an important staple food for 2 billion people on development country (FAO, 1995) [6]. In 2014, Indonesian rice productivity was reduced 0,63% than 2013. In the recent years, the decreasing of rice harvest because reduced of productivity amount 0,33% (BPS, 2015) [3]. Commonly the main factor reduced of rice harvest is presence of pest insects and diseases. The one of human effort against pest insects is insecticides application. Unfortunately, synthetic insecticides as the plant protection material has a negative effect. Synthetic insecticides playing important role as the source of poison in ecosystem, increasing pest insects resistance, resurgence and endangered status of natural enemies. Currently, botanical insecticide as the solution to control pest insects development. The advantages of botanical insecticides is: low toxicity on mammals, safety for human health and environment, avoid resistance, non toxic for beneficial insects, improve plant health, cheaper and easy to apply (Shepard et al., 1987; Prakash et al., 2008) [20] [16]. Neem seed as the famous botanical insecticides can be used against pest insects (Abdullah et al., 2001) [1]. Schmutterer (1990) [18] suggested that neem (Azadirachta indica A. Juss.) family Meliaceae as the important botanical insecticides to control pest insects on the tropic. Extract of neem seed contain azadirachtin have been reported to disrupt normal feeding behavior of several insect species, reduced reproduction system, neuroendocryne system, cultur cells and protein synthesis (Mordue, 2004) [10]. Commonly, a part of neem such as leaves, fruit, seed, root and bark contain azadiractin, salanin, mechantriol and triterpenoid (liminoid) as broad spectrum secondary metabolite. They are as poison materials for pest insects development (Parrotta and Chaturredi, 1994) [14]. Overall, secondary metabolite from neem against pest insects is low toxicity for mammals, safety residue and simple extraction process (Morgan, 2004) [11]. Therefore, this study focus to neem seed extract as a botanical insecticide at rice crops in order to determine its impact on different planting time of soybean against pest insects populations in rice.

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2 METHODOLOGY

Research was conducted at the rice crops in village Balleanging-Balloci, Pangkajene islands District, South Sulawesi on March until August 2014. Pest insects from field were carried out and identified in Pest Laboratory, Pests and Plant Diseases Dept., Faculty of Agriculture, Hasanuddin University Makassar, Indonesia.

2.1. Land Preparation and Cultivation of Soybeans and Rice

The study was conducted in rice fields with fine irrigation channels. Extensive field trials was held in areas 0.8 ha. Measurement of each rice terrace is 900 m^2. The study was used nine rice field separated by one rice field for each treatment. Rice is planted at the same time for each treatment. We were used Ciherang rice seed with direct seedling methods. Rice distance between one to another plant uniform for each treatment, measurement 20 cm × 20 cm. Soybean planting in the terraces was held by two different planting time : soybeans planted in conjunction with cultivation of rice and

soybeans planted after 17 days of rice planting. We were used Anjasmoro soybean seed with uniform spacing for each treatment, measurement 20 cm × 20 cm. Soybean planting on the terraces edge and one lines of soybean plants in each terraces with lenght 52 m. Fertilizing is giving once when rice plants age 30 days with a dosage of urea 300 kg/hectare, KCl 100 kg/hectare and 150 kg NPK/hectare. Fertilization of soybean one time after its age 14 days with Phonska and urea 250 kg /hectare, respectively.

2.2. Preparing of neem seed extract

Neem seed extract obtained by soaking 750 g of dried neem seeds in water (1.5 L) during a week. Marinade as the result of neem seed extract was filtered for 50% concentration. Neem seed extract will be applied into the crops by spraying diluted extract 1.5 L added water 13.5 L in order to obtain the concentration of extract to 5%.

2.3. Research implementation

Study was conducted in Randomized Block Design with three treatments and each treatment consisted three replications : neem seed extract in similar time for rice in field and soybean, neem seed extract in rice and soybean 17 day after rice planting, synthetic insecticides application contain active ingredients Delthametrin on soybean and Chlorpyrifos on rice 17 day after planting, respectively. Time spraying of neem seed extract together with synthetic insecticides. Spraying insecticide was done two times during the observation after rice crops aged 71 and 86 day after planting with similar time and concentration for each treatment i.e 15 mL/ 15 L of water.

2.4. Observation

Before D-vac pump began, we put the sample plant inside body was made from plastic pipe and cover of tile cloth (lenght = 1m, width = 1m, height = 1.5m) to avoid insects escape. Pest insects populations in rice plants was collected by D-vac pump with powered from battery.We were sucking pest insects with D-vac start from top of cover until near the roots of sample plant. The result of D-vac were put into plastik for identification in laboratory. We were used four units samples in each fields. One observation sample unit contain 25 rice clumps in a box (1m x 1m). Two units of samples has distance 0.5 m and two another units with distance 2.5 m from terraces. The distance between sample unit is adjusted to the observation of rice fields. Observations began when rice aged 65 day after planting. Observations were carried out six times with span of observations once a week (65, 72, 79, 83, 92 and 100 day after planting).

2.5. Data Analysis

Data analysis of pest insects population, we were used SPSS at Analysis of Variance (ANOVA) with DMRT level 95% (α = 0,05).

3 RESULT AND DISCUSSION

The result was showed pest insects populations which dominant found on rice is : *N. virescens*, *N. lugens* , *S. incertulas* and *L. oratorius* (Tables 1). Another type of insect pests such as *C. chalcites* not presented here because their population is very low.

Table 1. *The Number of Pest Insect Population (individual/m^2) with Neem Seed Extract and Synthetic Pesticides.*

Pest Insects	Treatment	Number pest insects population (individual/m²) based on rice age (day after planting)					
		65	72	79	86	93	100
N. virescens	Neem seed extract (rice and soybean); planting time similar for both plants.	4.00a	8.00a	30.00b	28.33a	3.00a	11.67a
	Neem seed extract (rice and soybean); soybean planting time 17 days after planting rice.	1.00a	14.67ab	6.67a	19.67a	6.33a	7.67a
	Delthametrin (soybean), Chlorpyrifos (rice); soybean planting time 17 days after planting rice.	4.67a	20.00b	34.00b	21.67a	6.67a	23.67a
N. lugens	Neem seed extract (rice and soybean); planting time similar for both plants.	0.00	9.33a	10.33a	8.33a	2.33a	0.33a
	Neem seed extract (rice and soybean); soybean planting time 17 days after planting rice.	0.00	11.00a	7.33a	6.00a	1.33a	6.00a
	Delthametrin (soybean), Chlorpyrifos (rice); soybean planting time 17 days after planting rice.	0.00	19.67a	22.33b	1.67a	3.33a	3.00a
S. incertulas	Neem seed extract (rice and soybean); planting time similar for both plants.	2.00a	1.00a	2.00a	7.33a	4.33b	2.33b
	Neem seed extract (rice and soybean); soybean planting time 17 days after planting rice.	3.00a	2.33a	1.67a	4.33a	1.00a	0.67a
	Delthametrin (soybean), Chlorpyrifos (rice); soybean planting time 17 days after planting rice.	1.00a	2.67a	3.00a	5.67a	0.67a	2.00b
L. oratorius	Neem seed extract (rice and soybean); planting time similar for both plants.	0.00	0.33a	0.00a	0.00	2.67a	4.00a
	Neem seed extract (rice and soybean); soybean planting time 17 days after planting rice.	0.00	0.33a	1.00b	0.00	10.67a	1.33a
	Delthametrin (soybean), Chlorpyrifos (rice); soybean planting time 17 days after planting rice.	0.00	0.00a	0.00a	0.00	10.00a	20.33b

*Means followed by the same letters are not significantly different at the 5% level by Duncan's multiple range test.

Nephotettix virescens D

N. virescens is a vector infectious viral tungro disease in rice. Tungro disease is an endemic at several provinces in Indonesia (Widiarta *et al*., 2014) [22]. The results was showed neem seed extract treatment for rice cultivation is able to inhibit development of *N. virescens* when compared to synthetic insecticides (Delthamethrin and Chlorpyrifos). The results of ANOVA was showed on 72 days after rice planting, neem seed extract treatment can suppress growth of *N. virescens* about 60% compared to synthetic insecticide. The best treatment to suppress growth and development of *N. virescens* is the neem seed extract combined different planting time of soybean. The observation in 76 days after planting was showed reducing growth of *N. virescens* up to 6.67 individual compared neem seed extract and synthetic insecticides is 30.00 and 34.00 individual, respectively. Pathak and Khan (1994) [15] state that cultivation of legumes after rice planting is recommended to reduce leafhopper and planthopper infestation.

Nilaparvata lugens S

N. lugens (planthoppers) and leafhoppers are vectors viral diseases in rice. The optimum growth temperature ranges from 25 - 30°C, *N. lugens* can adapting in high temperatures, but less fertile and their eggs can not hatch (Pathak and Khan, 1994) [15]. Total population of *N. lugens* were found low than *N. virescens*. The results was showed better treatment of neem seed extract and its combination with a treatment different planting time of soybean is able to suppress the growth of *N. lugens*. The treatment was showed results better than synthetic insecticides. Results of analysis of ANOVA in 79 days after planting showed growth reduction occurred of *N. lugens* amount 53.74% and 67.17%, respectively. According to Senthil-Nathan *et al*. (2009) [19] neem extract causes decreasing the amount of food ingested and assimilated by *N. lugens*. The utilization of neem extracts can be used effectively to inhibit the growth and resilience of *N. lugens*.

S. incertulas

Commonly *S. incertulas* major distributed in the tropics, in addition, also found in areas with temperatures above 100°C . *S. incertulas* larvae act as the rice stem borer. These species are found in Bangladesh, India, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam and some in Indonesia areas (Pathak and Khan, 1994) [15]. The results was showed the observation of 93 days after planting, a synthetic insecticide is able to reduce growth and development of *S. incertulas* (0.67 individual/m^2) compared to neem seed extract (4,33 individual/m^2). However, ANOVA on 100 days after planting was showed neem seed extract and different planting time of soybean against *S. incertulas* growth higher than synthetic insecticide treatment. Nboyine *et al.*, (2013) [12] state that neem seed effective against pest insects in cotton. Growth reduction of *S. incertulas* indicates that neem seed extract has great capability and potential reduce growth of disease-causing *S. incertulas* on rice stem borer. The same research results have been reported by Islam *et al.* (2013) [8] as neem extracts can be used as an effective plant to threat diseases in rice stem borer. Similarly, results of the study reported by Justin and Preetha (2014) [9] showed the percentage reduction neem oil is good against rice stem borer *S. incertulas* on rice.

Leptocorisa oratorius F

L. oratorius is the most important of rice crops in sub-tropical and tropical areas. Their living on range 30 - 50 days and up to 110 - 115 days (Pathak and Khan, 1994) [15]. The result was showed two treatments neem seed extract and its combination with different time planting of soybean gives better results in reducing growth of *L. oratorius*. The results of ANOVA in 100 days after planting, neem seed extract could reduce the growth of *L. oratorius* to 80.32 % while the combination treatment of neem seed extract and different planting time of soybean reduce growth of *L. oratorius* up 93.46%. Results indicate that neem seed extract capable and can be used as an alternative in tackling the rice plant diseases caused by the growth of *L. oratorius*. Similar result study have been reported by Chakraborty (2011) [4] that neem extract from seed, leaves, root, and bark is able to decreasing disease that caused by *Leptocorisa*. Commonly whole plant extracts of neem is able to inhibit growth on nymph and adult.

Chrysodeixis chalcites E

C. chalcites has the lowest pest populations in rice field. The results was showed no significant difference to total population of *C. chalcites* in observed of the three types of treatment given. This indicates the neem seed extract as an alternative to natural insecticides have been able to suppress growth of *C. chalcites* population. According Chakraborty (2011) [4], the characteristic flavour of neem capable of interfering resistance and cause disease in insects, mainly the content of alkaloid.

4 Conclusion

Neem seed extract can be used as the botanical insecticide to inhibit growth of pest insect in rice. Extract treatment with different time planting of soybeans is able to reduce the number of pest insect populations i.e : *N. virescens* (80.38 %), *N. lugens* (67.17 %), *S. incertulas* (66.5 %) and *L. oratorius* (93.46%) when compared with synthetic insecticides (Delthamethrin and Chlorpyrifos).

References

[1] Abdullah Md, Sarnthoy O, Isichaikul S and Tantakom S., 2001. Efficacy of Cypermethrin, Neem Extract and Bacillus thuringiensis for Controlling Insect Pests of Vegetable Soybean. Kasetsart J (Nat.Sci) 35 : 14-22.

[2] BPS. 2015. Produksi Padi Tahun 2014 (Angka Sementara) Diperkirakan Turun 0,63 Persen. http://www.bps.go.id/index.php/brs/1122. (access date 13 May 2015) (in-Indonesian).

[3] Chakraborty K. 2011. Extent of Suppression of Rice Ear Head Bug, Leptocoryza acuta. The Population by Different Neem Formulation In Field of Paddy Cultivar Swarna Mashuri (MTS 7029) Dury Kharif Season. ARPN Journal of Agricultural and Biology Science 6 : 37-41.

[4] FAO.1995. Food and Agriculture Organization of The United Nations. FAO Quarterly Bulletin of Statistics 8, 1-2.

[5] FAO, 2004. Food and Agriculture Organization of The United Nations. The State Of Food Security in The World, 30-31.

[6] Islam MD, Das S, Islam KS, Rahman A, Huda Md. N and Dash PK. 2013. Evaluation of Different Insecticides and Botanical Extracts Against Yellow Stem borer, Scirpophaga incertulas In Rice Field. International Journal of Biosciences 3 : 117-125.

[7] Justin CGL and Preetha G. 2014. Survey on The Occurrence, Distribution Pattern and Management of Stem Borers on Rice in Kanyakumari District, Tamil Nadu. Journal of Entomology and Zoology Studies, 2 (67) : 86-90.

[8] Mordue AJ. 2004. Present Concepts of The Mode of Action of Azadirachtin from Neem ; Editor: Koul O and Wahab S. Neem : Today and in The New Millennium : Kluwer Academic Publisher : United State of America.

[9] Morgan ED. 2004. The Place of Neem Amoy Modern Natural Pesticides; Editor Koul O and Wahab S. Neem: Today and in The New Millennium: Kluwer Academic Publisher : United State America.

[10] Nboyine JA, Abudulai M and Opera-Atakora DY. 2013. Field Efficacy of Neem (Azadirachta indica A. Juss) Based Biopesticides for The Management of Insect Pest of Cotton in Northern Ghana. Journal of Experimental Biology and Agricultural Sciences 1(4) : 321-327.

[11] Parrotta JA and Chaturredi AN. 1994. Azadirachta indica A.Juss. neem, Margosa Meliaceae Mahogany Family. SO-ITF Sm-70 : 1-8.

[12] Pathak M.D and Khan Z. R. 1994. Insect Pests of Rice. International Rice Research Institute (IRRI), International Center of Insect Physiology and Ecology (ICIPE), Manila, Philippines.

[13] Prakash A, Rao J and Nandagopal V. 2008. Future of Botanical Pesticides in Rice, Wheat, Pulses and Vegetable Pest Management. Journal of Biopesticides 1(2) : 154-169.

[14] Schmutterer H. 1990. Properties and Potential of Natural Pesticides from The Neem Tree, Azadirachta indica. Annual Review of Entomology 35 : 271-297.

[15] Senthil-Nathan S, Man-youg C, Chae-Hoon P, Hong Yul. S and Icalaivani K. 2009. Toxicity and Physiological Effects Of Neem Pesticides Applied To Rice on the Nilaparvata lugens Stal, The Brown Planthopper. Ecotoxicology and Environmental Safety 72 : 1707-1713.

[16] Shepard BM, Barrion AT and Litsinger JA. 1987. Serangga, Laba-laba dan Patogen yang Membantu. Cetakan Ketujuh. Diterjemahkan oleh Untung K, Wirjosuharjo S dari Helpful insect, Spiders, and Pathogens, IRRI, 126. (in-Indonesian).

[17] Widiarta IN, Bastian A and Pakki S. 2014. Variation in Rice Tungro Virus Transmission Ability by Green Leafhopper, Nephotettix virescens Distant (Homoptera : Cicadellidae) on Rice Resistant Varieties. Indonesian J. Agric. Sci, 15 : 65-70.

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