Repelence of Bintaro Plant Extract (*Cerbera manghas*) against pod-sucking insects (*Riptortus linearis*) (Hemiptera)

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Abstract-The mechanism of the organic pesticides of Bintaro plant extract (*Cerbera manghas*) in reducing the insect pest population needs to be continuously studied. The study aims to determine the Repelence (ability to resist) of bintaro plant extracts against brown ladybugs (*Riptortus linearis*). The factorial experiment with the first-factor treatment was extracted Bintaro plant organs, namely leaf extract, stem bark extract, fruit pulp extract and bintaro seed extract, while the second treatment factor was the extract concentration (w/v), namely a concentration of 2,5%, a concentration of 7,5%, and a concentration of 12,5%. The experimental variables were the chemical compound content of each Bintaro plant part extract, insect mortality, length of each instar and stadia, and development into the next instar or stadia. The research results showed that Bintaro plants (leaves, fruit, seeds and bark) contain ingredients that can be used as organic pesticides. Bintaro plant extract has an effect on the mortality and development of *Riptortus linearis* insects. The results of the Bintaro plant extract test on the mortality and development of *Riptortus linearis* insects are less significant if it will be used to suppress the population, but the application of organic pesticides in the field is proven to be able to suppress the population, reduce the level of crop damage and increase crop production.

Keywords—

I. INTRODUCTION

Pod-sucking pests (*Riptortus linearis*) attack post-flowering soybean plants, are important pests that can cause a decrease in yield both in quality and [1], [2]. The nymphs and adults damage the soybean pods by sucking the liquid of the seeds on the young pods, causing deformation of the seeds, the young pods drying out and falling out, which in turn causes a decrease in production both in quality and quantity [3]. The pod-sucking pest, *Riptortus linearis* is the most dangerous pest among post-flowering soybean pests with an average intensity of 61,37% of the total affected pods and 61,67% of the total seeds affected. [4-5]. Riptortus insects destroy the pods and seeds of cowpeas. Adult insects and nymphs suck the liquid from the young shoots and pods, causing the plant shoots to dry out and the young pods to drop [6].

The pod sucking pest control that is relatively safe, cheap, and easy is to use botanical/vegetable pesticides. Dependence on synthetic pesticides should be avoided because of their detrimental effects on human health, the environment, and the development of resistant strains of pathogens and pests. Botanical pesticides are effective in dealing with various plant pests, cheap, easily biodegradable, have a variety of ways of working, easily available sources and have low toxicity to non-target organisms [7]. The use of vegetable pesticides is effective in controlling sucking pests on cotton, and is proven to be non-toxic to natural enemies of pests and environmentally friendly [8]. Several plants that have been studied as biopesticides among others the plant extracts of *Spondias mombia, Momordica charantia, Mitrocarpus villosus* and *Chenopodium ambrosioides* for pod sucking pests. [9], the plant extracts of *Xylopia aethiopica* (Dunal) A. Rich., *Zingiber officinale* L. and *Capsicum annuum* L.) for pest control of *Maruca vitrata* Fab. (Lepidoptera: Pyralidae) and *Clavigralla tomentosicollis* Stal (Hemiptera: coreidae) 10], plant extracts of *Annona muricata* and *Piper guineense* are very effective at controlling thrips [11], papaya and babadotan leaf extract for *Riptortus linearis* insects [5], *Azadirachta indica*, *Cymbopogon nardus* and the rhizome of *Alpinia galanga* to control soybean pests [12], cashew nut shells, Albasia bark, Siamese weed, candle bush leaves, for cacao pod borer [13], kamandrah seed extract and spinosad biopesticide for brown ladybugs [14],[6],[15], water extract of mango parasite of *Dendrohtoe pentandra* (L.) Miq) affects the biology of *Spodoptera litura* F [16]. *Annona squamosa* seed powder, castor seed powder with L. *lecanii* fungi are able to control brown ladybugs [17].

Vegetable pesticides are less toxic to predators of coccinellidae than synthetic pesticides [18]. The efficacy of biopesticides is influenced by variations in the content of active ingredients in plants, concentrations, and its manufacturing process [19].

In Bintaro plants are found antioxidants, cytotoxics, antimicrobials, stabilizers of membrane activity and reduction of thrombolytic activity which can be used as a reference for *Cerbera odollam* plants as biopesticides. [20]). Bintaro plant extract has the potential to control sucking pests. Bintaro plant extracts have been studied to control the *Spodoptera litura* pest [21-22], to control caterpillars in tamarind [23], for the Aedes aegypti mosquito [24]. The methanol extract of *Cerbera manghas* fruit, twigs and leaves was able to control *Panonychus citri* directly [25].

The mechanism of organic pesticides (plant extracts) in reducing pest insect populations needs to be continuously studied. Organic pesticides (plant extracts) have no effect on insect pests in obtaining their hosts, as the results of research by [26] which concluded that the giving of Bintaro leaf extract *(Cerbera manghas*) had no effect on the response of brown ladybugs (*Riptortus linearis*, Hemiptera) behavior in getting the host. According to [8] that vegetable pesticides begin to decrease its toxicity after 96 hours. However, an effective pest reduction was noted for up to one week. The use of plant compounds (essential oils, flavonoids, alkaloids, glycosides, esters and fatty acids) has an anti-insect effect and is important as an alternative to chemical compounds used in pest control in various ways, namely repellents. [27]. This study aims to determine the Repelence (ability to resist) of bintaro plant extracts against brown ladybugs (*Riptortus linearis*).

II MATERIAL AND METHOD

The research on "The Repelence of Bintaro Plant Extracts (*Cerbera manghas*) against pod-sucking insects (*Riptortus linearis*)(Hemiptera)" is an integral part of the research of [22] on Response of *Riptortus linearis* towards the application of Bintaro (C*erbera manghas*) leaf extract. Bintaro plant material is developed into 4 parts, namely leaves, bark, pulp and seeds. The research was conducted at the Plant Protection Laboratory, Faculty of Agriculture, Wijaya Kusuma University, Surabaya.

III RESULTS AND DISCUSSION

Phytochemical Content of Bintaro Plant Organs as Biopesticides Material - The results of phytochemical analysis of Bintaro plants showed that all parts of the plant contained polyphenols, saponins, steroids, flavonoids and tannins. The part of the Bintaro fruit pulp plant contains saponins of 3,01% the highest compared to other plant parts, the leaves contain 3,04% polyphenols the highest compared to other plant parts and the bark contains 3,08% tannins the highest compared to other plant parts. The data of phytochemical content of Bintaro plants more details presented in Table 1.

The Mortality of Riptortus linearis F. Insects-The results of the analysis of variance on the riptortus insect mortality data concluded that there was an interaction between the extracted plant organ treatment factors and the concentration treatment, so that the presented is a combination treatment between two treatment factors. The experiment used a two-day old first instar nymph, which was small, soft and still very sensitive. Insect mortality occurred starting on the first day although only occurred in two treatments. The mortality rate continues to increase and the highest mortality is in Bintaro seed extract treatment with a concentration of 7,5%. On the 15th day of observation of the control treatment, no died yet, the mortality rate in Bintaro plant extract treatments increased with the highest mortality rate of 58,33% in the leaf extract treatment with a concentration of 2,5%. There are still many treatments with a mortality rate below 25%, some are even 0% (still all alive). Observations were conducted up to day 24, when all the insects had become adults. Mortality rate data for riptortus insects which given the treatment of the concentration of the Bintaro plant part extract presented in Tables 2a, 2b, and 2c.

Riptortus insects are very active, rarely stay in long bean pods (feed). The insect takes the food by jabbing the stylet then sucks the liquid of long bean pods. Bintaro extract that exists on the surface of long bean pods is less likely to be sucked into the insect's body. Physical contact between insects and Bintaro extract can occur when the insects are on the surface of long bean pods for a relatively long time.

The development of *Riptortus linearis F*. Insects from instar 1 to imago- In the ages of riptortus insects instar 2 to instar 5 there were no significant difference among the treatments, including comparison with control. In the ages of adult riptortus insect there were significant differences among the treatments. Riptortus insects with the treatment of Bintaro seed extract with a concentration of 7,5% and 12,5% have a relatively short age, namely 35,33 days for a concentration of 7,5% and 26,67 days for a concentration of 12,5%, while the other treatments its ages were over 40 days old. Data on the mean age for each instar, preadult/mature stadia and adult stadia of riptortus insects for each treatment are presented in Table 3.

The age of the riptortus insects from hatching eggs to death due to old age was significantly different among the treatments. Riptortus insects with the treatment of Bintaro seed extract with a concentration of 7,5% were able to live for 47,67 days, with a concentration of 12,5% were able to live for 44,33 days shorter than other treatments with an average of more than 55 days. The age of the riptortus insects until the mortality 50% significantly different among the treatments. The fastest 50% mortality occurred in the treatment of Bintaro leaf extract with a concentration of 2,5%, namely at the age of 15 days, then the seed extract treatment with a concentration of 7,5% died 50% at the age of 19 days. Data on the total age and time of 50 percent mortality of the *Riptortus linearis* insects with the treatment of the concentration of extracts of leaf, bark, fruit and seeds of Bintaro are presented in Table 4.

The treatment of Bintaro plant extract did not significantly affect the development of riptortus insects from first instar to third instar, and into fourth instar, but had a significant effect on the development into fifth instar and into imago. The percentage of the development of the first instar caterpillar to imago, the lowest amounted to 62,50% occurred in the seed extract treatment with a concentration of 7,5% which was significantly different compared to the control treatment of

the development of first instar to imago amounted to 100%. Data on the development of Riptortus linearis insects from the first instar to the next until the imago with the treatment of various concentrations of the extracts of leaf, bark, fruit and seeds of Bintaro presented in Table 5.

Discussion-The treatment of the extract of leaf, fruit and stem bark of bintaro did not kill the Riptortus insects, and only Bintaro seed extract caused 33,33% Riptortus linearis insect mortality on the seventh day after treatment. The results of this study are in line with the results of research by [5] that the application of the extracts of papaya leaves and babadotan leaves with a concentration range of 30% - 70% causes *Riptortus linearis* mortality by 21,57% on 7 days after application and this not different from the control. If the Bintaro extract is eaten by insects it will cause death. Susilo, et al. 2019 [26] concluded that the provision of Bintaro leaf extract (*Cerbera manghas*) had no effect on the behavioral response of the brown ladybugs Insect (*Riptortus linearis*, Hemiptera) in getting a host and did not cause the significant mortality. Bintaro plant extract that is sprayed on the feed does not enter the digestive system because the riptortus takes food by sticking the stylet in the tissue. According [28] Bintaro leaf extract granules (*Cerbera odollam* Gaertn). can cause the mortality of armyworms (*Spodoptera litura* Fab). because the extract material is eaten and enters the digestive system of the caterpillar, the higher the granular concentration of Bintaro leaf extract (*Cerbera odollam* Gaertn.), then the higher the mortality of armyworms (*Spodoptera litura* Fab.).

Bintaro plant extract treatment has no significant effect on the development period of the preadult/mature phase, but seed extract can shorten the lifespan of adult insects. Bintaro plant extract treatment had an effect on the development of pre-adult/mature insects (nympha) into adult insects (imago). In line with the research results of [22] which concluded that Bintaro plant extract reduced caterpillar weight, inhibited ecdysis causing failure of 2nd instar development to 3rd instar and development into pupae from *Spodoptera litura*. Plant compounds in the form of essential oils, flavonoids, alkaloids, glycosides, esters and fatty acids have anti-insect effects in various ways, namely repellents, food inhibitors/antifeedants, toxic, growth inhibitors, chemosterilants, and attractants [27].

The use of plant extracts proven to be able to control pests in the field, although the mortality test is not as effective as synthetic pesticides. Petroleum ether extracts of *A. muricata* and *P. guineense* seeds are very effective in controlling thrips and pod borer pests in beans. [11]. The combination of seed powder botanical pesticide of *Annona squamosa*, Castor seed powder with the entomopathogenic fungus of *L. lecanii* was able to control *Riptortus linearis* [17]. Leaf extracts of *Tephrosia vogelii* and *Azadirachta indica* can reduce the intensity of pod damage by sucking pests and borer pests and increase soybean seed yields. [1]. Extracts of *Azadirachta indica* A. Juss, and *Chromolaena odorata* (L.) were able to suppress the damage by pod sucking pests and increase the yield of cowpea seeds. [29]. Neem seed oil extract and garlic were able to reduce the population of *Riptortus dentipes* in cowpea and bitter melon pods during the two rainy seasons [3]. Plant extracts of *Spondias mombia, Momordica charantia, Mitrocarpus villosus* and *Chenopodium ambrosioides* can be used as biopesticides that effectively control pod-sucking insect pests in cowpeas [9]. The treatment of water extracts from *Azadirachta indica* A. Juss, *Chromolaena odorata* (L.) and *Ricinus communis* (L.) plants can suppress the pod sucking pest population of *Riptortus linearis* and increase cowpea production [29]. The water extracts of *Hyptis suaveolens, Azadirachta indica, Manihot esculenta, Thevetia neriifolia* and *Cymbopogon nardus* plants were able to significantly reduce the pod sucker population. [15]. Vegetable insecticide formulations have the prospect to be developed further and have the potential to reduce the use of synthetic insecticides [13]. Plant extracts work slowly, but can be considered as an alternative pesticide that is environmentally friendly and applicable in developing countries [30]. Vegetable insecticides only affect target insects, do not kill beneficial natural enemies, provide residue-free food and a safe environment for humans [27].

IV CONCLUSION

Bintaro plants (leaves, fruit, seeds and bark) contain ingredients that can be used as organic pesticides. Bintaro plant extract has an effect on the mortality and development of *Riptortus linearis* insects. The results of the Bintaro plant extract test on the mortality and development of *Riptortus linearis* insects are less significant if it will be used to suppress the population, but the application of organic pesticides in the field is proven to be able to suppress the population, reduce the level of crop damage and increase crop production. From this phenomenon, it should be assumed that there is a possibility that plant which sprayed with organic pesticides tend to be avoided by insect pests. Research on the Repelence of Bintaro plant extracts against insect pests needs to be developed in the field.

There are needs for empirical proof of the existence of absolute Repelence of biopesticide ingredients, namely insect pests are really not interested in visiting plants that containing biopesticides so that the population is low, or there is an apparent/quasi Repelence, namely insect pests actually come to plants but because they are exposed to biopesticide treatment, the insects do not develop so that their population low

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Table 1. Results of the Analysis of Phytochemical Active Ingredients of Bintaro plant organs (*Cerbera manghas*) as a Source of Biopesticides Material

No	Material	Phytochemical Types				
		polyphenols %	**saponins %**	**steroids %**	**Flavonoids %**	**Tannins %**
1	young fruit pulp (coir)	1,35	3,01	1,32	2,15	0,21
2	seeds (ripe fruit)	1,03	2,18	1,24	0,38	0,34
3	Leaf	3,04	2,63	1,05	1,42	0,48
4	Bark stem/twigs	0,53	0,26	2,11	0,14	3,08

Table 2a. The Mean Percentage of *Riptortus linearis* mortality with the treatment of concentration of the extract of leaf, stem bark, fruit pulp and seeds of Bintaro (*Cerbera manghas*)

Treatment	% Mortality at day ---							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Control	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
K_1B_1	0,00	0,00 b	4,17 b	4,17 b	4,17b	4,17b	4,17b	16,67ab
K_3B_1	0,00	0,00 b	4,17 b	4,17 b	4,17b	4,17b	4,17b	4,17b
K_5B_1	0,00	0,00 b	4,17 b	4,17 b	4,17b	4,17b	4,17b	4,17b
K_1B_2	0,00	0,00 b	0,00 b	0,00 b	0,00b	0,00b	4,17b	4,17 b
K_3B_2	0,00	0,00 b	4,17 b	4,17 b	4,17b	4,17b	4,17b	4,17b
K_5B_2	0,00	4,17 b	4,17 b	8,33 b	12,50b	12,50b	12,50b	16,67ab
K_1B_3	0,00	0,00 b	0,00 b	0,00 b	0,00b	0,00b	0,00b	0,00b
K_3B_3	0,00	0,00 b	0,00 b	0,00 b	0,00b	0,00b	0,00b	0,00b
K_5B3	4,17	4,17 b	4,17 b	4,17 b	4,17b	4,17b	8,33b	8,33 b
K_1B_4	0,00	0,00 b	4,17 b	4,17 b	4,17b	4,17b	4,17b	4,17b
K_3B_4	8,33	20,83 a	29,17 a	29,17 a	29,17a	29,17a	29,17a	33,33 a
K_5B_4	0,00	0,00 b	0,00 b	0,00 b	0,00b	0,00b	0,00b	0,00b
LSD	TN	5,83	12,60	13,88	15,79	15,79	16,15	19,34

Table 2b. The Mean Percentage of *Riptortus linearis* mortality with the treatment of concentration of the extract of leaf, stem bark, fruit pulp and seeds of Bintaro (*Cerbera manghas*)

Treatment	% Mortality at day ---						
	9	10	11	12	13	14	15
Control	0,00	0,00	0,00	0,00	0,00	0,00	0,00
K_1B_1	16,67ab	16,67ab	16,67abc	16,67abc	50,00 a	54,17 a	58,33a
K_3B_1	4,17 b	4,17 b	4,17 bc	4,17bc	4,17 d	4,17 cd	4,17cd
K_5B_1	4,17 b	4,17 b	8,33 bc	8,33bc	8,33 cd	8,33 cd	8,33cd
K_1B_2	4,17 b	4,17 b	4,17 bc	4,17bc	4,17 d	4,17 cd	8,33cd
K_3B_2	4,17 b	4,17 b	4,17 bc	4,17bc	4,17 d	4,17 cd	8,33cd
K_5B_2	16,67ab	16,67ab	25,00 ab	25,00ab	25,00 bc	25,00 bc	25,00bc
K_1B_3	0,00 b	0,00 b	0,00 c	0,00c	0,00 d	0,00 d	0,00 d
K_3B_3	4,17 b	4,17 b	4,17 bc	4,17bc	4,17 d	4,17 cd	4,17cd
K_5B3	8,33 b	8,33 b	8,33 bc	8,33bc	8,33 cd	12,50 cd	12,50cd
K_1B_4	4,17 b	4,17 b	8,33 bc	16,67abc	16,67 cd	16,67bcd	16,67bcd
K_3B_4	33,33 a	33,33 a	33,33 ac	37,50a	37,50 ab	37,50 ab	37,50ab
K_5B_4	0,00 b	0,00 b	0,00 c	0,00 c	0,00 d	0,00 d	0,00 d
LSD	19,63	19,63	22,58	22,33	20,06	22,08	22,83

Table 2c. The Mean Percentage of *Riptortus linearis* mortality with the treatment of concentration of the extract of leaf, stem bark, fruit pulp and seeds of Bintaro (*Cerbera manghas*)

Treatment	% Mortality at day ---				
	16	18	20	22	24
Control	0,00	4,17	4,17	4,17	4,17
K_1B_1	66,67 a	66,67 a	66,67 a	70,83 a	70,83 a
K_3B_1	4,17 de	4,17 d	4,17 d	4,17 d	4,17 de
K_5B_1	8,33 cde	8,33 d	8,33 d	12,50 d	16,67 cde
K_1B_2	8,33 cde	8,33 d	16,67 cd	16,67 cd	20,83 cde
K_3B_2	8,33 cde	8,33 d	8,33 d	8,33 d	12,50 de
K_5B_2	25,00 bc	25,00 bcd	25,00 bcd	25,00 bcd	25,00bcde
K_1B_3	0,00 e	0,00 d	0,00 d	0,00 d	0,00 e
K_3B_3	4,17 de	4,17 d	4,17 d	4,17 d	4,17 de
K_5B3	12,50 cde	12,50 cd	20,83 bcd	20,83 bcd	20,83 cde
K_1B_4	20,83 bcd	37,50 bc	41,67 abc	41,67 bc	41,67 bc
K_3B_4	37,50 b	45,83 ab	45,83 ab	45,83 b	50,00 ab
K_5B_4	0,00 e	0,00 d	8,33 d	20,83 bcd	29,17 bcd
LSD	20,48	25,19	27,14	26,40	26,72

Note: The average value in the same column followed by the same letter is not significantly different based on the 5% LSD test

K_0 : treatment of the extract concentration 0% B_1 : Bintaro leaf extract
K_1: treatment of the extract concentration 2,5% B_2: Bintaro stem bark extract
K_3: treatment of the extract concentration 7,5% B_3: Bintaro fruit extract
K_5: treatment of the extract concentration 12,5% B_4: Bintaro seed extract

Table 3. Length of development of the Riptortus linearis insect per instar with the treatment of concentration of the extract of leaf, stem bark, fruit pulp and seeds of Bintaro (*Cerbera manghas*)

Treatment	Length of development (days) per instar / stadia					
	instar 2	**instar 3**	**instar 4**	**instar 5**	**Total preadult**	**adult**
Control	4,67	3,67	3,33	2,00	13,33	40,67
K_1B_1	4,67 ab	4,67	3,33	1,00	12,33	45,67 a
K_3B_1	5,33 a	4,00	2,67	2,00	13,33	44,67 a
K_5B_1	3,33 bcd	4,00	3,33	2,33	12,33	43,67 a
K_1B_2	4,33 abc	3,67	3,33	1,33	13,00	44,33 a
K_3B_2	2,67 cd	3,33	3,33	1,67	12,00	45,33 a
K_5B_2	4,67 ab	4,00	2,00	2,33	14,33	42,67 a
K_1B_3	2,00 d	4,00	3,00	1,33	10,33	45,67 a
K_3B_3	1,67 d	3,33	3,67	1,33	10,33	47,67 a
K_5B3	3,33 bcd	3,67	2,67	1,67	11,00	46,00 a
K_1B_4	4,33 abc	3,33	2,33	2,67	13,00	43,00 a
K_3B_4	5,67 a	3,67	2,00	2,67	14,00	35,33 b
K_5B_4	5,67 a	4,67	2,33	3,33	14,33	26,67 c
LSD	1,87	TN	TN	TN	TN	6,04

Note : The average value in the same column followed by the same letter is not significantly different based on the 5% LSD test

K_0 : treatment of the extract concentration 0% B_1 : Bintaro leaf extract
K_1: treatment of the extract concentration 2,5% B_2: Bintaro stem bark extract
K_3: treatment of the extract concentration 7,5% B_3: Bintaro fruit extract
K_5: treatment of the extract concentration 12,5% B_4: Bintaro seed extract

Table 4. The total age and time of 50 percent mortality of the *Riptortus linearis* insects with the treatment of the concentration of extracts of leaf, bark, fruit and seeds of Bintaro (*Cerbera manghas*)

Treatment	Total length of life (day)	length of 50% mortality (day)
Control	55,00	49,33
K_1B_1	58,33 a	15,00 d
K_3B_1	59,00 a	46,33 ab
K_5B_1	57,33 a	54,33 a
K_1B_2	58,33 a	53,67 a
K_3B_2	58,33 a	42,00 ab
K_5B_2	58,33 a	35,00 bc
K_1B_3	57,00 a	53,67 a
K_3B_3	59,00 a	56,33 a
K_5B3	58,00 a	44,67 ab
K_1B_4	57,33 a	33,33 bc
K_3B_4	47,67 b	19,00 d
K_5B_4	44,33 b	26,33 cd
LSD	5,93	15,02

Note : The average value in the same column followed by the same letter is not significantly different based on the 5% LSD test

K_0 : treatment of the extract concentration 0% B_1 : Bintaro leaf extract
K_1: treatment of the extract concentration 2,5% B_2: Bintaro stem bark extract
K_3: treatment of the extract concentration 7,5% B_3: Bintaro fruit extract
K_5: treatment of the extract concentration 12,5% B_4: Bintaro seed extract

Table 5. The percentage development of *Riptortus linearis* insects from the first instar to the next instar, and the imago with the treatment of the given of various concentrations of the extracts of leaf, bark, fruit and seeds of Bintaro (*Cerbera manghas*)

Treatment	Percentage development from first instar to instar...			
	instar 3	**instar 4**	**instar 5**	**imago**
Control	100,00	100,00	100,00	100,00
K_1B_1	93,75	91,67	83,33 ab	70,83 bc
K_3B_1	93,75	95,83	95,83 ab	95,83 ab
K_5B_1	100,00	95,83	95,83 ab	91,67 ab
K_1B_2	100,00	95,83	95,83 ab	91,67 ab
K_3B_2	93,75	95,83	95,83 ab	95,83 ab
K_5B_2	100,00	79,17	75,00 bc	75,00 abc
K_1B_3	100,00	100,00	100,00 a	100,00 a
K_3B_3	100,00	100,00	95,83 ab	95,83 ab
K_5B3	100,00	91,67	91,67 ab	91,67 ab
K_1B_4	100,00	95,83	91,67 ab	83,33 abc
K_3B_4	93,75	70,83	62,50 c	62,50 c
K_5B_4	100,00	100,00	100,00 a	100,00 a
LSD	TN	TN	21,56	24,51

Note: The average value in the same column followed by the same letter is not significantly different based on the 5% LSD test

K_0 : treatment of the extract concentration 0% B_1 : Bintaro leaf extract

K_1 : treatment of the extract concentration 2,5% B_2: Bintaro stem bark extract

K_3 : treatment of the extract concentration 7,5% B_3: Bintaro fruit extract

K_5 : treatment of the extract concentration 12,5% B_4: Bintaro seed extract

Figure 1 Bintaro leaves

Figure 2 Bintaro bark

Figure 3 Bintaro fruit (still young)

Figure 4 Bintaro seed