Status and Population of Arthropod on Mungbean

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Abstract. There are quite numerous of arthropods associated with mungbean from early growth until harvesting time. The objective of this study was to determine the species, population, and status of arthropods associated with mungbean. The experiment was conducted in Ngale Experimental Station, East Java, during rainy and dry season 2015. The insect collection were done using pitfall trap, yellow sticky trap, sweep net, and visual. The treatments were insecticide application time; P1= started at 14 days after planting (DAP) up to harvesting; P2= 8 and 35 DAP up to harvesting; P3= 8, 14, 21, 35 DAP; P4= no application, and P5= full application. The diversity of arthropods on the dry season washigher than that on rainy season. Pest found on mungbean were Diptera (Agromyzidae), Lepidoptera (Noctuidae, Pyralidae, and Crambidae), Homoptera and Hemiptera. The highest population of pest dominated by Homoptera (124 individuals), Hemiptera (57 individuals), and Lepidoptera (60 individuals). The predators found on mungbean were Collembola (Poduridae and Entomobryidae), Coleoptera (Coccinellidae), Araneida (Oxyopidae), Odonata (Aeshnidae and Petaluridae), and Hymenoptera (Formicidae). The parasitoid found was Hymenoptera (Braconidae, Eulophidae, Chacidoidae). The performance of natural enemies can be optimizedfor suppressing pest populations in mungbean by conservation, introduction, and augmentation.

Keywords: biodiversity, arthropod, pest, natural enemies, mungbean.

1. Introduction

Mungbean (Vignaradiata L.) is one of the species of leguminocoeae that contain high nutrients, namely proteins, omega 3, and omega 6, which are needed for human health [1,2]. The characteristic of this commodity are relatively shorter in age, drought tolerant, and can be intercropped with other commodities as compared with other leguminocoeae. Therefore, it has the great opportunities to be developed in marginal land [3-5]. Based on the cultivation area of mungbean which increased by year, indicates that many farmers have a high interest to cultivate the mungbean [6].

There are numerous of arthropods associated with mungbean. There status are pest, viral vector, natural enemies (predator and parasitoid), and other beneficial insects (decomposers and pollinators) that inhabit the plant canopy and soil surface [7,8]. Lu et al. [9] identified about 64-200 arthropods associated with mungbean that consists of 48 families from ordo Coleoptera, Diptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Orthoptera, Thysanoptera, and Acarina. Moreover, Nugraha [10] reported that arthropods complex found on mungbean field are Diptera, Thysanoptera, Homoptera, Hemiptera, Coleoptera, and Araneida as a pest from the early growth until harvesting time and natural
enemies. In Indonesia, the major pest on mungbean dominated by pod borer (*Maruca testulalis*) and leaf feeder (*Longitarsus suturellus*), both of them caused high yield losses up to 80% [11].

Ganapathy [12] mentioned that parasitoid and predator are potential to suppress the development of *M. testulalis* on all stage (egg, larva, and pupa). In field, the population of predator and parasitoid can be increased through the conservation of environmental and a wise insecticide application. According to Hossain *et al.* [13], predator Coccinellidae can prey Aphid up to 168 individuals. Moreover, Collembola, the predator that inhabit soil surface, can prey pest by the management of cultivation practices [14]. Parasitoid from the family of Braconidae can naturally suppress the population of *M. testulalis*. The abundance of natural enemy is highly dependent on the cultivation system and the frequency of chemical insecticide applications [15]. The population dynamics of natural enemy such as *Coccinellarepanda* depend on the sustainability of their prey, aphids (*Aphididae*) as well as various insects from the ordo of Hemiptera (*Coccidae*, *Pseudococcidae*, and *Diaspididae*). Based on the predation and parasitization ability, the role of these natural enemies can be optimized on integrated pest management of mungbean [16–18]. Hence, the monitoring of existence and stability of the arthropods in field is important to be done before planting in order to determine their status and population as the basic information for an effective and efficient control strategy. The objective of this study was to identify the species, population, and status of arthropods associated with mungbean during rainy season and dry season on 2015.

2. Materials and methods
The experiment was conducted in Ngale Experimental Station, Ngawi, East Java, Indonesia, on rainy season (February-March) and dry season (July-August) 2015. The experiment was arranged using randomized block design with five treatments and five replicates. The treatments were insecticide application time; P1= started at 14 DAP up to harvesting; P2= at 8, 35 DAP up to harvesting; P3= at 8, 14, 21, 35 DAP; P4= no application, and P5= full applications.

Mungbean *Vima* 1 was planted on a plot of 4 m x 5 m with the spacing of 40 cm x 15 cm, 2 seeds/hole. Urea 37.5 kg / ha; SP36 73.5 kg / ha; and KCl 37.5 kg/ha were applied twice, at planting time and 28 DAP. Before planting, mungbean seeds were treated with mankozeb fungicide to avoid infection of soil fungus. Weeding was done manually on 14 and 28 DAP.

The diversity of species and population of arthropod was observed by (1) visual on 10 samples randomly, (2) pitfall trap, this method was done by using plastic cups consist of water and 25% detergent then immersed on the soil up to 24 hours. Three pitfall traps were used in each plot in order to inventory the species and population of arthropod that inhabit soil surface. The arthropod trapped on pitfall then was inserted into the bottle that contain of 95% alcohols, (3) Yellow sticky trap sized 20 x 20 cm. It placed on three spots in each plot with the position across the wind direction. Yellow trap was used to catch all arthropods that inhabit plant canopy, and (4) Sweep net. This kind of trap was used to catch all active insects around the plant. This method was done as many as three times in a single swing on three spot in each plot.

The observation on plot 1 (P1) was aimed to inventory the arthropod on early growth (5-13 DAP). Plot 2 (P2) was aimed to inventory the arthropod on vegetative phase. Plot 3 (P3) was aimed to inventory the arthropod on generative phase. Plot 4 (P4) was aimed to inventory all arthropod that appear on early growth up to harvesting time. However, plot 5 (P5) was aimed to inventory all arthropods that alive and develop even though have been full applied by chemical insecticide. All arthropod obtained through the pitfall trap, yellow sticky trap, and sweep net were inserted on the bottle and be brought into the laboratory to be identified based on morphological character then grouped on each family [19,20].
3. Results

3.1. Species and population of arthropod on rainy season

The species and population trapped by pitfall and yellow trap on P1 were 39 individuals. They are pests that appear on early growth such as bean fly (*Ophionymia phaseoli*) (Aphromyzidae: Diptera) and leaf sucking (*Aphis* sp.) (Aphididae: Homoptera). Moreover, there are predators *Oxyopes* sp. and *Collembola* (17 individuals) trapped on P1 (table 1). The abundant species and population of arthropod on dry season was found on P4, dominated by predator from the ordo of Araneida, Collembola, Dermaptera (family Forficulidae), 94 individuals.

The arthropods found on P3 are species that attack mungbean during generative phase. There were found 40 individuals from three kinds of trap which dominated by leaf sucker such as white fly (*Bemisiatabaci*) (Aleyrodidae: Homoptera) and (*Aphis* sp.) (Aphididae: Homoptera), pods sucking bug such as brown stinks bug (*Riptortus linearis*) and green stinks bug (*Nezara viridula*) (Alydidae: Hemiptera). Moreover, on P3 also was found top borer (*Melanogromyza dolichostigma*) (Agromyzidae: Diptera) as many as 3 individuals. Predator from the ordo of Collembola and Coleoptera and also parasitoid from the family of Braconidae were found on P3.

The arthropods obtained on P2 by using pitfall trap dan yellow sticky trap are 26 individuals, consists of top borer and leaf sucker from the family of Aphididae. Moreover, there were found predator that inhabit soil surface such as Collembola and parasitoid from the family of Braconidae. However, arthropod obtained on P5 are 13 individuals, consists of white fly and predators (Collembola and *Paederus fuscipes*).

3.2. Population of arthropods on dry season 2015

The population of arthropod obtained by three kinds of trap on dry season was more abundant than that obtained on rainy season. A total of 854 individuals were found on dry season. However, only 202 individuals were found on rainy season (table 2). The high population of arthropods was found on P4 (no chemical insecticide application). A total of 157 individuals were trapped by pitfall trap, consist of bean fly 23 individuals, grasshopper and *Gryllidae* (Orthoptera) 23 individuals, *Oxyopes* sp. (Araneida: Oxyopidae) seven individuals, *Lycosidae* 24 individuals, *Collembola* 80 individuals, and *Formicidae* five individuals. There were also found two individuals of insect decomposer from the family of Forficulidae (Dermaptera) and eight individuals of parasitoid from the family of Braconidae (Hymenoptera).

A total of 103 individuals were trapped by using yellow sticky trap on P4, its consist of 32 individuals of *Aphis* sp. and *B. tabaci*, three individuals of *Gryllidae*, 23 individuals of *Coccinella sp.*, 21 individuals of *Syraphidae* and *Asilidae* (Diptera), 22 individuals of *Formicidae*, and two individuals of parasitoid from the family of Braconidae. Arthropods trapped by sweep net on P4 were more abundant than the arthropod trapped by pitfall trap and yellow sticky trap. They are consists of *O. phaseoli* (140 individuals), top borer (11 individuals), *Aphis* sp. and *B. tabaci* (23 individuals), *Acrididae* (five individuals), *Lamprosema indicata* (7 individuals), and *M. testulalis*. In P4, there were found predator from the family of *Oxyopidae* and *Lycosidae* (21 individuals), *Coccinellidae* (15 individuals), *Syraphidae* (Diptera) (9 individuals), *Formicidae* (18 individuals), *Mantidae* (Orthoptera) (2 individuals), and *Aeshnidae* (Odonata) (5 individuals). However, only one individual of parasitoid *Braconidae* was found in P4.

A total of 72 individuals from eight ordos and 12 families were found on P3. Arthropod trapped by yellow sticky trap were 35 individuals, consists of arthropod from the ordo of Coleoptera, *Diptera*, Hemiptera, Homoptera, and Orthoptera. Moreover, there were eight families trapped by yellow sticky trap on P4, consists of *Coccinellidae* (11 individuals), *Syraphidae* (2 individuals), and *Asilidae* (5 individuals). Arthropod pests trapped by yellow sticky trap on P3 were *B. tabaci* (8 individuals), *Aphis* sp. (5 individuals), and *N. viridula* (2 individuals). However, the arthropod trapped by pitfall trap were only 28 individuals, consists of 4 order and 5 families where 3 families are *Oxyopidae*, *Poduridae*, and *Entomobryidae*.  

\[ \text{Species and population of arthropod on dry season} \]

\[ \text{Population of arthropods on dry season 2015} \]
Table 1. Population of arthropods trapped by pitfall trap, yellow sticky trap, and sweep net on mungbean in Ngale Experimental Station, East Java (Rainy Season 2015).

| Treatment | Pitfall trap<sup>5</sup> | Yellow sticky trap<sup>6</sup> | Sweep net<sup>5</sup> |
|-----------|-----------------|-----------------|-----------------|
| P1        | Araneida<sup>12</sup> | Diptera<sup>1</sup> | -               |
|           | Oxyopidae<sup>12</sup> | Agromyzidae<sup>1</sup> |               |
|           | Collembola<sup>17</sup> | Homoptera<sup>7</sup> |               |
|           | Poduridae<sup>11</sup>, Entomobryidae<sup>6</sup> | Aphididae<sup>3</sup> |               |
|           | Diptera<sup>2</sup> |               |               |
|           | Agromyzidae<sup>3</sup> |               |               |
| P2        | Collembola<sup>16</sup> | Homoptera<sup>5</sup> | -               |
|           | Poduridae<sup>3</sup>, Entomobryidae<sup>13</sup> | Aphididae<sup>3</sup> |               |
|           | Diptera<sup>3</sup> | Hymenoptera<sup>2</sup> | Braconidae<sup>5</sup> |
|           | Agromyzidae<sup>3</sup>, Syrphidae<sup>2</sup> | |               |
| P3        | Collembola<sup>6</sup> | Coleoptera<sup>2</sup> | Coleoptera<sup>4</sup> |
|           | Poduridae<sup>6</sup> | Coccinellidae<sup>3</sup> | Coccinellidae<sup>4</sup> |
|           | Diptera<sup>3</sup> | Hemiptera<sup>2</sup> | Hemiptera<sup>5</sup> |
|           | Agromyzidae<sup>3</sup>, Syrphidae<sup>2</sup> | Alydidae<sup>2</sup> | Alydidae<sup>3</sup>, Reduviidae<sup>2</sup> |
|           | | Homoptera<sup>3</sup> | Homoptera<sup>11</sup> |
|           | | Aphididae<sup>3</sup> | Aleyrodidae<sup>7</sup>, Aphididae<sup>4</sup> |
|           | | | Hymenoptera<sup>2</sup> |
|           | | | Barconidae<sup>2</sup> |
| P4        | Araneida<sup>5</sup> | Coleoptera<sup>3</sup> | Coleoptera<sup>9</sup> |
|           | Oxyopidae<sup>5</sup>, Lycosidae<sup>1</sup> | Coccinellidae<sup>3</sup> | Coccinellidae<sup>5</sup>, Staphylinidae<sup>4</sup> |
|           | Collembola<sup>24</sup> | Diptera<sup>11</sup> | Hymenoptera<sup>3</sup> |
|           | Poduridae<sup>16</sup>, Entomobryidae<sup>8</sup> | Agromyzidae<sup>9</sup>, Asilidae<sup>2</sup> | Alydidae<sup>6</sup> |
|           | Dermoptera<sup>4</sup> | Homoptera<sup>9</sup> | Homoptera<sup>11</sup> |
|           | Forficulidae<sup>4</sup> | Aphididae<sup>9</sup> | Aphididae<sup>5</sup>, Aleyrodidae<sup>6</sup> |
|           | Diptera<sup>4</sup> | Hymenoptera<sup>3</sup> | Hymenoptera<sup>3</sup> |
|           | Agromyzidae<sup>3</sup>, Syrphidae<sup>2</sup> | Braconidae<sup>6</sup> | Braconidae<sup>2</sup>, Formicidae<sup>3</sup> |
| P5        | Collembola<sup>8</sup> | - | Homoptera<sup>2</sup> |
|           | Poduridae<sup>8</sup> | | Aleyrodidae<sup>2</sup>, Coleoptera<sup>3</sup> |
|           | | | Staphylinidae<sup>3</sup> |

<sup>7</sup>Superscript numbering in each ordo/family showed the total number of individual found.
Table 2. Population of arthropods trapped by pitfall trap, yellow sticky trap, and sweep net on mungbean in Ngale Experimental Station, East Java (Dry Season 2015).

| Treatment | Pitfall trap | Yellow sticky trap | Sweep net |
|-----------|--------------|--------------------|----------|
| P1        | Araneida², Oxyopidae², Collembola²², Poduridae¹⁹, Entomobryidae⁴, Diptera³, Agromyzidae⁵ | Coleoptera¹, Coccinellidae⁹, Oxyopidae¹³, Diptera³, Agromyzidae⁸, Coccinellidae⁷, Anthicidae⁵ | Araneida¹, Coccinellidae⁹, Oxyopidae¹³ |
| P2        | Araneida¹, Oxyopidae¹, Collembola⁴², Poduridae³⁸, Entomobryidae⁴, Hymenoptera³, Braconidae¹, Formicidae¹, Orthoptera², Mantidae², Hymenoptera², Braconidae¹, Formicidae¹ | Coleoptera²⁷, Coccinellidae²⁷, Oxyopidae², Diptera³, Agromyzidae⁶, Poduridae² | Araneida¹, Coccinellidae⁹, Oxyopidae¹³ |
| P3        | Araneida¹, Oxyopidae¹, Collembola²⁰, Poduridae¹⁷, Entomobryidae³, Diptera¹, Agromyzidae³, Orthoptera³, Gryllidae³ | Coleoptera¹¹, Coccinellidae¹¹, Diptera¹, Syrphidae², Asilidae⁵, Homoptera¹³, Aleyrodidae⁸, Aphididae⁵, Orthoptera³, Acrididae² | Araneida¹, Coccinellidae⁹, Oxyopidae¹³ |
| P4        | Araneida²¹, Oxyopidae¹, Lycosidae¹⁴, Collembola⁸⁰, Poduridae⁶⁹, Entomobryidae¹¹ | Coleoptera³, Coccinellidae³, Diptera³, Syrphidae⁹, Asilidae¹², Coccinellidae⁹, Lycosidae¹², Coleoptera¹⁵ | Araneida²¹, Oxyopidae¹, Lycosidae¹⁴ |


A total of 114 individuals identified as a predator and parasitoid and 37 individuals are pest on P2. There was *O. phaseoli* trapped with pitfall trap even though insecticide application was done from 8 DAP, and 35 DAP up to harvesting time. Moreover, pod sucking from the family of Alydidae and Miridae were found 11 individuals. According to Nishimoto *et al.* [33], the existence of brown stink bug in field was influenced by insect preference on plant colour and kind of trap used.

### 3.3 Status of Arthropods

Arthropods population found on rainy season was lower than that found on dry season. The arthropod trapped by pitfall trap, yellow sticky trap, and sweep net play a role as pest from the order of Diptera, Homoptera, Hymenoptera, Orthoptera, dan Lepidoptera. On rainy season, during February and March, the rainfall was high about 15,38 ml and 12,91 ml, respectively. However, the rainfall on July and August (dry season) were only 2,14 ml dan 2,90 ml, respectively (table 3).

Kind of pests identified on rainy season were top borer (*O. phaseoli* and *M. dolichostigma*), leaf sucker (*B. tabaci* and *Aphis* sp.), and pod sucking (*R. linearis* and *N. viridula*) (figure 1). Pest was found on early growth (P1) was bean fly, top borer, and leaf sucker. Pest on P2 dominated by leaf sucker (5 individuals) and top borer. However, on P3 were founded leaf sucker (14 individuals), pod sucking (7 individuals), and top borer (5 individuals). Adult top borer that trapped on P3 or during generative phase identified as adult that appeared from the plant attacked by top borer [34].

Arthropods identified as pest on dry season including Diptera, Homoptera, Hymenoptera, Orthoptera, and Lepidoptera. On P4, in dry season, were found top borer (34 individuals), leaf sucker (55 individuals), pod sucking (12 individuals), leaf feeder (31 individuals), Lepidoptera (19 individuals), pod borer (7 individuals), and Crambidae (figure 2).

The status of arthropods on mungbean is as decomposer, predator, parasitoid, and pollinator. Their population were high except on rainy season. On P1 during rainy season, the population and predator

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**Table 1: Population of arthropods trapped on dry season 2015**

| Treatment  | Pitfall trap | Yellow sticky trap | Sweep net |
|------------|--------------|---------------------|-----------|
| Dermaptera | Homoptera    | Diptera             |
| Forficulida| Aphidida     | Agromyzida          |
| Diptera    | Hymenoptera  | Syrpidae            |
| Agromyzida | Braconida    | Alydidae            |
| Hymenoptera| Homoptera    | Eduvia            |
| Homoptera  | Orthoptera   | Homoptera            |
| Braconida  | Gryllida     | Aphiida            |
| Orthoptera | Gryllida     | Aphiida            |
| Acridida   | Gryllida     | Formicida          |
| Oxyopida   | Coleoptera   | Syrpidae            |
| Coleoptera | Coccinellida | Homoptera          |
| Coccinellida| Aphidida   | Aphiida            |
| Collembola | Homoptera    | Homoptera          |
| Podurida   | Homoptera    | Aphiida            |
| Diptera    | Homoptera    | Aphiida            |
| Agromyzida | Homoptera    | Aphiida            |

*Superscript numbering in each ordo/family showed the total number of individual found*
were 29 individuals. However, on dry season, there were 81 individuals founded (figure 3). The abundance of natural enemies on dry season dominated by predator inhabit soil surface from the ordo of Collembola, Araneida, and Coleoptera. On P2 and P3, the natural enemies dominated by Collembola, Araneida, and Coleoptera. However, the predator found on P4 was Formicidae (22 individuals) from the ordo of Hymenoptera.

| No. | Month     | Average of rainy and dry season 2015 | Temperature (°C) | Rainfall (mm) |
|-----|-----------|--------------------------------------|-----------------|---------------|
| 1   | January   | 22-34                                | 7.53            |               |
| 2   | February  | 22-34                                | 15.38           |               |
| 3   | March     | 23-34                                | 12.91           |               |
| 4   | April     | 22-34                                | 9.71            |               |
| 5   | May       | 22-33                                | 6.90            |               |
| 6   | June      | 21-33                                | 7.25            |               |
| 7   | July      | 21-33                                | 2.14            |               |
| 8   | August    | 20-32                                | 2.90            |               |
| 9   | September | 22-33                                | 9.13            |               |
| 10  | October   | 21-33                                | 12.52           |               |
| 11  | November  | 23-34                                | 11.8            |               |
| 12  | December  | 22-34                                | 6.82            |               |

**Figure 1.** Mungbean pest trapped by pitfall trap, yellow sticky trap, and sweep net on rainy season 2015 in Ngale.

**4. Discussion**

P1 was done to observe the population of arthropod on juvenile stage in which no application of insecticide up to 14 days after planting. The kind of arthropod found on juvenil staged was less as compare with other stages because the mungbean plant still young so only foliage pest and soil insect appeared. However, there was *R. linearis* on P1. This phenomenon occurred maybe due to the application of insecticide did not kill the egg of *R. linearis* so they can hatch toward pod development. This finding similar with [32], adult of *R. linearis* laid egg toward the pod development or around 35 DAP. Top borer (*Melanagromyza dolichostigma*) from Dipteraordo usually found during juvenile stage. It may be developed from the eggs that were laid by adult *M. dolichostigma* on the other host plants around the field then infested to mungbean. Predator from the ordo of Araneida, Collembola,
Dermaptera (family Forficulidae) that play an important role as plant waste decomposer also found on each treatment with the different number and composition.

On P4, there were found many species and population of arthropod because we did not applied the chemical insecticide from the early growth up to harvesting time thus the insect can survive well. According to [21,22], insect population was higher on field without insecticide application than that on field with chemical insecticide application. Moreover, mungbean field with no insecticide application and planted by intercropping system was more preferred to be inhabited by the species of arthropod pest and natural enemies [28,29].

**Figure 2.** Mungbean pest trapped by pitfall trap, yellow sticky trap, and sweep net on dry season 2015 in Ngale.

| Treatment | Pest Population (individual) |
|-----------|-----------------------------|
| P1        | 15 4 26                      |
| P2        | 43 7 28                      |
| P3        | 13 3 42                      |
| P4        | 34 12 55                     |
| P5        | 2 0 0                        |

| Treatment | Natural Enemies Population (individual) |
|-----------|----------------------------------------|
| P1        | 29 81                                  |
| P2        | 18 77                                  |
| P3        | 12 74                                  |
| P4        | 38 250                                 |
| P5        | 11 31                                  |

**Figure 3.** Population of predator and parasitoid on mungbean in Ngale (Dry Season and Rainy Season 2015)

P5 showed quite low diversity of arthropod due to the application of chemical insecticide (deltametrin). The application of insecticide did not affect the existence of predator Collembola and P.
fuscipes, because these two predators are inhabit soil surface. According to Avicor et al. [23], the existence of arthropod in field applied by chemical insecticide did not disturb their habitat thus the insect can survive and continue their development. Fountain et al. [24] reported that deltametrin has less negative impact on the abundance of Collembola and Araneida. According to Komala et al. [25,26], predator P fuscipes has high mobility thus this insect can protect themselves from the negative impact during the application of insecticide. Non-target insects were more susceptible to the chemical insecticide than insect pest [27]. Predator population inhabit soil surface such as P. fuscipes relatively more stable and more secure from the disturbance of environmental factor because this insect have high mobility [35]. Collembola and Araneida were still found on P5 where there was full application of insecticide. This condition occurred due to Collembola and Araneida were very mobile in soil thus the application of insecticide cannot infect them [36-38].

In order to collect insect from different habitat, we used different kind of trap namely pitfall trap, yellow sticky trap, and sweep net. According to Idris et al. [30] and Carrizo [31], the kind of trap will affect the species and number of arthropod obtained from the field. The arthropod trapped by pitfall trap, yellow sticky trap, and sweep net play a role as pest from the order of Diptera, Homoptera, Hemiptera, Ortoptera, dan Lepidoptera.

Arthropods population found on rainy season was lower than that found on dry season. The low population of arthropods found on rainy season maybe due to the high intensity of rain on mungbean fields thus the eggs, larva, nymph, and adult were slammed by the wind. This condition supported by the highly rainfall on February and March which was 15,38 ml and 12,91 ml, respectively as compare with the rainfall on July and August.

Some ordo, family, and species were found only on dry season and they did not appear on rainy season such as those from the ordo Lepidoptera, Maruca sp. High population of Maruca sp. found on generative phase especially during pod filling and its found on the plot with no insecticide application. It is indicated that this pest is potentially reduce theming bean production because it attacked pod which is important [339], even though their population decreased due to insecticide application from early growth up to harvesting time such as on P5 [40].

This study inform that the arthropod associated with mungbean were pest, predator, parasitoid, decomposer, and pollinator. Based on the abundance and existence of natural enemies especially predator and parasitoid, their performance can be optimized as a biocontrol agent for leaf sucker, pod sucking, and pod borer on mungbean. These natural enemies also known have a high predation capacity [41-45]. The performance of natural enemies can be optimized in biological control by conservation or environmental manipulation, introduction, and augmentation [46].

5. Conclusion
Species and population of arthropods on mungbean field trapped by pitfall trap, yellow sticky trap, and sweep net on rainy season was lower than the population on dry season. Arthropods status as potential pest on early growth was bean fly (O. phaseoli), on vegetative phase were top borer (M. dolichostigma), leaf sucker (Aphis sp.) and white fly (B.tabaci), and pod sucking (R. linearis and N. viridula), and on generative phase was pod borer (Maruca sp.). Artropoda status as natural enemies including ordoDiptera (Syrphidae and Asilidae), Araneida (Oxyopidae and Lycodidae), Collembola (Poduridae and Entomobryidae), Coleoptera (Coccinellidae), Dermaptera (Forficulidae), Hymenoptera (Braconidae and Eoluphidae), (Orthoptera (Mantidae), Hymenoptera (Chacidoidae and Aeshnidae). The role of natural enemies can be optimized in biological control of mungbean pest.

Acknowledgments
I want to acknowledge my funding source for this research, the Ministry of Agriculture, Republic of Indonesia, Indonesian Agency for Agriculture Research and Development (IAARD) through the DIPA.
References

[1] Mubarak A E 2005 *Food Chemistry* **89**(4) 489-485
[2] Nanyen D, Dooshima I B, Julius A and Benbella I 2016 *International Journal of Nutrition and Food Science* **5**(6) 401-406
[3] Kumar A and Sharma K D 2009 *Journal of Agronomican Crop Science* **95** 270-277
[4] Rafiei S M and Ashgaripur MR 2009 *Journal of Modern Agriculture Knowledge* **5**(15) 67-76
[5] Ratnasekera D and Subhashi A P T 2015 *Journal of Agriculture Search* **2**(3) 162-166
[6] BPS 2016 Food crop production 2016 *Badan Pusat Statistik*
[7] Dalwadi M M 2005 Population dynamics of insect pest complex of Indian bean (*Lablab purpureus* L.) and their management *Thesis Submitted to Anand Agricultural University, Anand, Gujarat*
[8] Chakraborty D, Korat D M and Saneera E K 2013 *Insect Environment* **19**(1) 63-64
[9] Lu YH, Wu KM, Wyckhugs KA G and Gao Y Y 2009 *Crop Protection* **22**(1) 77-81
[10] Nugraha A P 2013 The diversity of pest and natural enemie on mungbean field (*Vigna radiata* L.) [*Skripsi*] (Bogor: Department of Protection, Faculty of Agriculture, Bogor Agriculture University)
[11] Indiati S W 2007 **11**(2) 138-147
[12] Dananon EA, Tamo M, Huis A V and Dicks M 2002 *Biological Control* **57**:415-425
[13] Norton G, Taylor M, Thiele K and Pickering J 2000 *Identification suide to insect orders* (Australia: The University of Queensland)
[14] Schell S and Latchininsky A 2007 Insect identification. (United Stated: University of Wyoming)
[15] Rana H, Khan M F, Fahim M and Tariq S A 2013 *International Journal of Biology and Biotechnology* **10**(2) 271-274
[16] Ngatimin SN 2016 Persence of soil insects in field with grandular insecticides application *International Centre Development Oriented Research in Agriculture (ICRA)* (Wageningen, The Netherlands) 29 February-18 March 2016 1-3
[17] Avisor SW, Ezhia VY, Owusu E O and Wajidi MF R 2014 *Sains Malaysiana* **43**(1) 31-36
[18] Fountain MT, Brown VK, Gunge AC, Symbonson WO C and Muray P J 2007 *Pedobiology* **51**(2) 147-158
[19] Komala DP, Yadav D N and Jha A 2003a *Indian Journal of Entomology* **65**(3) 319-323
[20] Komala DP, Yadav D N and Jha A 2003b *Indian Journal of Entomology* **65**(1) 77-75
[21] Ndam ON, Ogunwolu E O and Manggoel W 2012 *Journal of Agriculture Science* **2**(3) 061-067
[22] Xie HC, Chen JL, Cheng DF, Zhou HB, Sun J R, Liu Y and Francis F 2012 *Journal of Economic Entomology* **105**(3) 854-859
[23] Ahirwar B and Bhowmick A K 2016 *Annals of Biology* **32**(1) 55-58
[24] Idris A B, Raff M N M and Ooi C L 2002 *Journal of Biological Science* **2**(5) 336-339
[25] Carrizo P 2008 *Cie. Inv. Agr* **35**(2) 155-160
[26] Prayogo Y 2012 Distribution of egg laid by brown stinks bug *Riptortus linearis* (Hemiptera: Alydidae) on soybean. *Proceeding of National Conferenceen Inovation of Dry Land Agriculture*. Kupang, 4-5 September 2012 184-197
[33] Nishimoto Y, Mizutani N and Moriya S 2003 *Kyushu Plant Protection Resources* 49 92-95
[34] Thapa R B 2012 *Nepalese Journal of Bioscience* 26 4-70
[35] Jadhoo M F and Shuka A K 2016 *International Journal of Life Science* 6 177-180
[36] Castano-Meneses G, Palacios-Vargas J G and Cutz-Puol L Q 2004 *Zoology* 75(1) 135-142
[37] Zayadi H, Hakim L and Leksono A S 2013 *Journal of Tropica Life Science* 3(3) 166-171
[38] Ambarashan P and Gopalswamy P 2013 *Pakistan Journal of Biological Science* 16 661-670
[39] Grigalli JFJ, Laurencila AL F and Avia C J 2015 *AJPS* 6(7) 537-544
[40] Mandal D, Bhowmik P, Baral K and Chatterjee M L 2013 *Journal of Crop and Weed* 9(2) 177-180
[41] Gerling D, Alomar O and Arno J 2001 *Crop Protection* 20(9) 779-799
[42] Huang CC, Peng W K and Talekar N S 2003 *Biological Control* 48(4) 407-416
[43] Khan A A and Zaki F A 2007 *Asian Journal of Biological Science* 2(1-2) 53-55
[44] Cuthbertson AG S 2014 *Insects* 5(3) 609-614
[45] Soleymani S, Hakim S M and Seiedy M 2016 *Biological Control, Science and Technology* 26(4) 562-569
[46] Naranjo SE, Ellsworth PC, Chu C C and Henneberry T J 2002 *Biology and Microbiology Control* 682-691