Effectiveness various kind traps for insect control based environmental friendly ways

S N Aminah, T Abdullah, A Nasruddin, and N A Sari
Department of Plant Pests and Diseases, Faculty of Agriculture, Hasanuddin University, Indonesia
E-mail: srifirnas@gmail.com

Abstract. The purpose of research is to study the effectiveness of various kind traps for insect control based environmental friendly in kangkong field. The experimental research was held in Pangngai village, Bantaeng Regency, South Sulawesi, Indonesia. Based insects collection in the Serimpi cultivar, there are 60 total individual s were collected divided into 8 order (Coleoptera, Hemiptera, Orthoptera, Isoptera, Lepidoptera, Diptera, Hymenoptera and Mantodea) including in the 22 families as pests, predators and decomposers. The findings of various kind traps applied was showed insect net method collected more pest insect (19 individual) than pitfall trap (11 individual) and yellow trap (10 individual), respectively. Based the research data was showed that insect net more effective in collected insects (45%) than pitfall trap (32%) and yellow trap (23%), respectively. The total harvest was showed the increasing number and quality of kangkong about 6 kg, more higher on the past (3-4 kg). In the future, the result of the research is very useful information for apply insect control based environmentally friendly ways.

1. Introduction
Since a few decades, the development strategies to conserve and maximize the abundance of insect biodiversity is very crucial to enhance biological control of agricultural crop pests. Kangkong (Ipomoea reptans Poir) family Convolvulaceae as the famous vegetables contain many nutritions and benefit, increasing human health. Kangkong is an economical vegetable and easy to find in the traditional market or supermarket. In South Sulawesi, the highest kangkong harvest from Takalar Regency (5.079 ton), Gowa Regency (4.828 ton), and Bone Regency (1.852 ton) [1].

The value of kangkong harvest has strongly related with the presence of insect pests and disease in the plantation. Commonly farmer controlling pests, diseases, and weeds with synthetic pesticides. However, in the past of the few decades, synthetic pesticides application remains soil residue and kill more beneficial microorganisms such as arthropods and soil microbes. Menta and Remelli (2020) state that soil health has affected insect biodiversity in the ecosystem [2]. Increasing of soil degradation since in the last few decades, has developed new identify methods to define not only soil quality but also plant health-related to biodiversity of the ecosystem. Some of soil invertebrates have been included in monitoring programs as bioindicators of soil quality. Being an important portion of soil fauna, the soil arthropods are involved in many soil processes such as organic matter decomposition and translocation, nutrient cycling, and microflora activity regulation.

Refer to development of technology, there are many environmental tools that detected the presence of insects in field, such as using a yellow trap and insect net [3,4]. Especially the pitfall trap used
biodegradable detergent mixing water with main purpose of killing the arthropods as soon as possible. Based the condition in the plantation, the purpose of the research is to study the effectiveness of various kind traps for insect control based on environmental friendly in kangkong field.

2. Methodology
A field trial was conducted at Pangngai village, Bantaeng Regency, South Sulawesi, Indonesia from November to December 2018. The treatments were arranged in a Randomized Block Design used cultivar Serimpi. The research used plot sizes length = 3 m, width = 1 m and height = 30 cm. Farmer was sown kangkong seeds followed the longitudinal path on the plot. Planting space used was 30 cm between rows. The research was used 4 plots.

The insects observation was held in the farmer kangkong field started 7 days after planting used pitfall trap, yellow trap and insect net. Pitfall trap used plastic glass (diameter 5 cm, height = 9 cm), filling half of glass with water and biodegradable detergent (2:1). The pitfall trap was planted parallel with soil surface for 24 hours. A yellow trap made from pieces of yellow paper, wrapped in plastic and their surface, contains safety adhesive for trap insects. Yellow trap used for 24 hours especially trapped flying insects in the plant canopy. Then insect net applied 10 swings per minute in the morning (07.00 am) (Figure 1). All of the methods of insect observation interval 7 days until harvest time.

Figure 1. Kangkong field with pitfall trap = ● yellow trap = ▶ and insect net = ○

Insect collection from various kind of trap was identified used literature [5]. The result analyzed by Analysis of Variance (ANOVA), the significant difference was detected using the Least Significant Different Test (α = 0.05).

3. Results and Discussion
Kangkong playing an important role as one of the cheaper vegetables in Indonesia. They are famous food and selling in many traditional market through remote areas. The high-quality harvest products affected by presence of insect pest at the field. The observation result of insects presence was showed their role at the kangkong field (Figure 2).
Based insect collection in the Serimpi cultivar, there are 60 total individual was collected divided into 8 order (Coleoptera, Hemiptera, Orthoptera, Isoptera, Lepidoptera, Diptera, Hymenoptera and Mantodea) including in the 22 families. Figure 2 was explained insect net as the best method collected pest insects with the highest number (19 individual), pitfall trap (11 individual) and yellow trap (10 individual), respectively. The lowest number of predators collected was showed at yellow trap only 2 black ants (Hymenoptera: Formicidae). Pitfall was trapped 5 individual and insect net collected the highest number of insect predators (8 individual). However, pitfall trap collected the highest number of decomposer (3 individual) than yellow trap (2 individual). Aminah et al. (2013) and Landis et al. (2005) state that predatory insects as main component in nature as controlling of pests [3,6]. Their presence can manage used flowering weeds as a food source for increasing their long life.

Insects as the important part of ecosystem playing different role as pests and beneficial (such as natural enemies, decomposer, pollinators etc). The application of various kind of trap in insect observation resulted from different compositions of insects was shown in Figure 3.

Commonly insects collected in research with purpose identification and determined their role in the ecosystem. Figure 3 was showed the effectivity collected insect used various trap such as insect net (45%), pitfall trap (32%) and yellow trap (23%). The dominant family of pests insect collected from insect net is: Hemipteran (Pyrrhocoridae), Orthoptera (Acrididae), Lepidopteran (Arctiidae, Yponomeutidae) and Diptera (Rhagionidae, Tephritidae). Pitfall trap as passive methods, actually effective for insects movement in the soil surface or fall from the plant canopy. There are Coleoptera (Curculionidae, Scarabaeidae), Hemiptera (Coreidae, Pyrrhocoridae) and Orthoptera (Acrididae). Such as pitfall trap, yellow trap also as passive trap for adult. In this research, insects trapped at yellow trap such as Coleoptera (Buprestidae), Hemiptera (Pyrrhocoridae, Lygaeidae), Isoptera (Rhinotermitidae), Lepidoptera (Sphingidae, Arctiidae) and Diptera (Rhagionidae). Few of potential insect predators
trapped in the various types of trap, including a total 15 individual divided into: Coleoptera (Carabidae, Cicindellidae, Coccinella), Hymenoptera (Formicidae, Vespidae), Orthoptera (Tettigoniidae) and Mantodea (Mantidae). Abdullah et al. (2017) state that various of trap affected size of insects trapped [7]. For example, insect net promise catches an insect in big size than the pitfall trap. Related to insect size, Landis et al. (2000) state that habitat management very important in conserve natural enemies, especially arthropod pests in crops [8]. Presence crops as food sources and refugia as the benefit of insect development in nature. Commonly many food source result insect natural enemies in higher population number and size better more than the poor field (dry land).

Actually the main purpose used the various insect trap methods was trapped of the insect pest. Based the research data was showed that insect net more effective in a collected insect. The reason why insect trap very effective than other methods because this is active method based visualization. Then insect net arranged by human, selective, and very flexible moved to another plot follow the pest insects. Pitfall and yellow trap as passive insect trap will catch more insect and not selective. Barberi et al. Vandekerkhove and de Clerq state that commonly insect visited crops for nectar, pollen or another products of plant [9,10]. Besides crop, the presence of weeds also affect to arthropods biodiversity with their different roles in nature. Landis et al. (2020) and Ruiz et al. (2011) suggested manipulating plant resources to enhance beneficial arthropods in agricultural landscapes [6,11]. Manipulating habitat needs more attention to avoid the starvation of natural insect enemies. For example, the management of weeds as the best way to conserve natural enemies in crops. The one recommendation avoid outbreak of insect pest with monitoring activities to detect presence of pest used various trap based the landscape structure, pattern and the crop variety.

The total harvest of kangkong was showed an increasing number about 6 kg, more higher on the past (3-4 kg). Then increasing the quality because of the product free from pesticides and another chemical compound. Our assumption about reduce number of insect in field, when observation many of insect pests trapped in the various kind of trap. The lowest population of insect as a possible for kangkong grow well and increasing harvest number and quality.

Meloni et al. (2020), Pearson and Tooker (2017) reported that commonly the species diversity and abundance of arthropods increasing by presence vegetation cover and methods controlling of pests in the field [12,13]. The communities under vegetation mainly respond to food availability and the presence of natural enemies. The availability of plant as a source of food and refugia seem to play a critical role as a reserve and source of arthropods diversity. The decreasing vegetation cover and changes in vegetation patterns can fast lead to a significant loss of ground arthropods diversity.

4. Conclusion
The findings about various kind traps applied were showed insect net method collected more pest insect (19 individual) than pitfall trap (11 individual) and yellow trap (10 individual), respectively. Based the research data was showed that insect net more effective in collected insects (45%) than pitfall trap (32%) and yellow trap (23%). In the future, the result of the research is very useful information for apply insect control based environmental friendly.

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