Flowering weeds and *Coccinellids* species in white maize field

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**Abstract.** The use of pesticides as a pest control in conventional cropping systems has caused various adverse effects such as pest resistance, resurgence and death of natural enemies. One of the best solutions is to use of natural enemies as biological control agents. Natural enemies can multiply quickly on flowering weed. The purpose of this research was to identify *Coccinellids* species and flowering weeds as a food source for them surrounding the maize field. Survey on the presence of *Coccinellids* species was conducted at maize field in Ta‘deang, Maros district, South Sulawesi (5°2’7’’S, 119°41’16’’E) in June until July 2019. Visual observation of *Coccinellids* species was conducted every weekend in the early morning. The survey was forming diagonally in fivesampling point (used 5 maize per sampling point) inside the maize field. Observation of *Coccinellids* species with interval 7 days. Flowering weeds were collected from similar field with *Coccinellids* species. The five sample of every flowering weeds were identified and recorded. The observations in white maize field from 35 to 56 days after planting indicate the common pest is grasshopper (*Valanga* sp.) (Orthoptera: Acrididae) and caterpillar hairy leaf *Orgyia antiqua* (Lepidoptera :Erebidae) and caterpillar hairy leaf *Orgyia antiqua* (Lepidoptera :Erebidae). Based on the identification of *Coccinellids* species in the white maize field, there are two lady bird beetle species such as *Verania discolor* and *Menochilus sexmaculatus*. Based on visual observations found flowering weeds such as :meniran/ *Phyllanthus niruri* (Phyllanthaceae); *Cleome rutidosperma* (Capparidaceae); patikan/ *Euphorbia hirta* (Euphorbiaceae), krokot/ *Portulaca* sp. (Portulacaceae) and *Eleusine indica* (Poaceae). The results indicated that two types of *Coccinellids* were found living in four types of the flowering weeds in white maize field.

1. **Introduction**

Maize is very important crops around the world. They are stapled foods and the source of raw material for cattle. The white maize (traditional maize called Pulut) as one of the famous maize in South Sulawesi. They are needed as raw materials for factories and home-scale industries. White maize has delicious taste, more savoury and fluffier. The savoury taste from the higher content of amylopectin (approximately 90%). Innovation food from white maize including instant rice-maize, white maize porridge and etc. Unfortunately, white maize has a weakness because the productivity level is still low between 2 - 2.5 tons per hectare. The new variety of white maize is Pulut URI (for Indonesian people) can be covered demand of maize industries [1].

Pests are one of the important factors caused yield losses in maize field of sweet corn and white corn. The important insects pest such as Asian stem borer (*Ostrinia furnacalis* Guenee), corn borer (*Helicoverpa armigera*) and army worm (*Spodoptera* sp.). Commonly the presence of insect pests in white maize plants is generally determined by farmers cropping patterns and migration from other
fields. *O. furnacalis* is the main pest of maize was caused yield loss. Continuous monoculture planting of white maize will reduce the diversity of organisms and trigger a population explosion of pests. Certain environmental conditions will change the physiological processes of white maize which further affect plant nutrients absorbed by phytophagous insects [8,9]. Many treatments controlled presence insect pest in white maize including biological control with natural enemies. Using natural enemies will reduce pesticide application and safety for the environment. One of the important predators in nature is lady bird beetle Coccinellidae. Coccinellids species could be a potential predator for insect pest in white maize. The immature stage and adult of ladybird prey eggs and nymphs of soft bodies insects surrounding plantation areas. Flowering weeds that grow around white maize field can be a food source for natural enemies because they produces nectar and pollen, for example are *Ageratum conyzoides*, *Galinsoga parviflora*, *Bidens pilosa* and etc [7,8,12]. The purpose of the research is to identify *Coccinellids* species and flowering weeds as a food source for them surrounding the maize field.

2. **Methodology**
Survey on the presence of *Coccinellids* species was conducted at white maize field in Ta’deang, Maros district, South Sulawesi (5°2’7’’S, 119°41’16’’E) in June until July 2019. The observation was started when the farmer’s white maize field at 35 until 56 days after transplanting. Our survey at farmer field planting white maize pulut variety *Arumba*. Based on the interview, the farmer field not applied to pesticides and only fertilizer such as urea.

2.1. *Coccinellids* species
Visual observation presence of lady bird beetle (larvae, pupae and adult) was conducted every weekend at early morning. The survey was forming diagonally in five sampling-point (used 5 white maize per sampling point) inside the field. Observation of *Coccinellids* species with interval 7 days. *Coccinella* species from white maize sampling-points were identified and recorded on-site using the magnifying glass. *Coccinellids* species was identified based standard literature [6].

2.2. **Flowering weeds**
Flowering weeds were collected from similar field with *Coccinellids* species. The five samples of every flowering weeds were identified and recorded. Flowering weeds was identified based standard literature [11,13].

3. **Results and Discussion**
The flowering weeds surrounding agriculture ecosystem playing important roles as source of nectar and pollen for natural enemies especially *Coccinellids* species. MacLeod et al. [9] had reported that predatory insects can be seen either with the naked eyes or magnifying glass to feed on the nectar or pollens of Euphorbiae and Umbelliferae species. Karise et al. [7] had reported the famous flowering weeds such as buckwheat (*Fagopyrum esculentum*) family Polygonaceae has nectar abundant in the morning and attracted different species of nectar feeders.

The observations in white maize field from 35 to 56 days after planting indicate the common pest is grasshopper (*Valanga* sp.) (Orthoptera: Acrididae) and caterpillar hairy leaf *Orgyia antiqua* (Lepidoptera :Erebidae) (Fig. 1).
Reduced number of insect pests found in white maize field because the plant was started flowering and forming cob. In that phase, the leaves of white maize become hard and difficult penetrated by insects. Amin [1] had reported commonly in 14 days after planting, maize plant attacked by *Altherigona* sp. and grasshoppers. They can cause damaged because the plant parts are still soft and contain a lot of water. Based on the identification of *Coccinellids* species in the white maize field, there are two ladybird beetle species such as *Verania discolor* and *Menochilus sexmaculatus* (Fig. 2).

In India, there are thirty *Coccinellids* species are reported in sugarcane ecosystem. They are important predator for different stages of soft bodies hemipterans, coccids, eggs and young larvae of Lepidopteran borers [2,5,10,12]. Butani [3] state that *V. discolor* were found to feed on nymphs and puparia of whiteflies *Aleurolobus barodensis* (Mask.). Effendy et al. [4] state that *Verania* sp. and *Coccinella* sp. is important predator controlled *Cnaphalocrosis medialis* in a maize plantation. Based on the data collection, *Verania* sp. were higher in Bima 3 (12 individual), Sukmaraga (10 individual), Anoman (9 individual) and Lamuru (6 individual). In contrast, lower population of *Coccinella* sp. only 2 individual at Bima 3 and Anoman, and 1 individual to Sukmaraga and Lamuru, respectively. Commonly *C. transversalis* were found in chilli growing center in the West Sumatra Province. The ability to prey of *C. transversalis* was high in the stages adult or larvae. The adult of *C. transversalis* was able to prey nymphs of *Bemisia tabaci*, *Myzus persicae* and *Aphis gossypii* about 46 – 48 individuals, 20 individuals and 23 individual, respectively.

Based on visual observations found flowering weeds such as: meniran/*Phyllanthus niruri* (Phyllanthaceae); *Cleome rutidosperma* (Capparidaceae); patikan/*Euphorbia hirta* (Euphorbiaceae) and krokot/*Portulaca* sp. (Portulacaceae) (Fig.3). Especially for *Eleusine indica* (Poaceae) not produce a flower.
Figure 3. *Phyllanthus niruri* (Phyllanthaceae); *Cleome rutidosperma* (Capparidaceae); *Euphorbia hirta* (Euphorbiaceae); *Portulaca* sp. (Portulacaceae) and *Eleusine indica* (Poaceae)

The result was showed flowering weeds as nectar and pollen source for lady bird beetles. Sri et al. [12] had reported that adults of *Coccinella* sp. were found to be dominant insect visited on *Crotalaria striata* (0.122 times), followed by *Lantana camara* (0.048 times) and *Ageratum conyzoides* (0.028 times). Floral characteristic and nectar abundance within the flowers are the main reason for insect visiting a flowers. Floral and extra-floral nectar are important food sources for many *Coccinellids* species such as *Stethorus puctillum*, which normally die within 4-5 days on water alone. They can survive for 43.2 days on diet from borago flowers (*Borago officinalis*). Vandekerkhove et al., [14] had reported that *Coccinella* sp. increasing their fecundity with consumed nectar and pollen from flowering weeds. In addition, farmers apply crop rotation patterns. Firstly, the field was planted with rice, after harvesting it was planted with maize and beans (soybeans or mung beans). This method can break the life cycle of insect pests. In addition, straw of rice buried in the ground and to be additional nutrients for the white maize plant.

The results of interviews with the farmer, the white maize never sprayed with chemicals because the crops were directly sold in raw or boiled maize. Another benefit *Coccinellids* species playing their role as a natural enemy by utilizing food derived from insect pest eggs, pollen and nectar obtained from flowering weeds. It seems farmer has protected the health of consumers by providing safety food from their field. During the survey at Ta’deang, the adults of lady bird beetles were found to be more in number in adjoining maize fields in 45 days after planting, because of the flowering stage of the maize. This is a suitable time because *Coccinellids* species are known to be pollen feeders of crops and flowering weeds. Samal and Misra [10] had reported that the adult of *V. discolor* feed on rice pollen while the larvae feed on nymphs and adult of *Nilaparvata lugens*. A similar condition in survey areas where farmers applied crop rotation and neighbour field serve pollen from their crops such as rice. The present study indicates flowering weeds playing function as pollen source and reservoir in harvest of maize.

4. Conclusion
The conclusion of the observation is: grasshopper (*Valanga* sp.) (Orthoptera: Acrididae) and caterpillar hairy leaf *Orgyia 4ntique* (Lepidoptera : Erebidae) as insect pest in the white maize field. Based on the identification of *Coccinellids* species in the white maize field, there are two lady bird beetle species such as *V. Discolor* and *M.sexmaculatus*. Flowering weeds surrounding white maize as important food source for *Coccinellids* species such as: *Cleome rutidosperma* (Capparidaceae) and *krokot/Portulaca* sp. (Portulacaceae). Further study needed to find out role of flowering weeds as refugia for *Coccinellids* species in wet season.

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