Effect Inhibitor Packlobutrazol of Against Type and Summed Dominance Ratio (SDR) Weeds in Potato (*Solanum tuberosum* L.) Plant

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Abstract—The research aimed tostudy determine the effect of plant growth regulator and dominance Paclobutrazol against this type of weeds in potato fields. Weed identification is done by using squares method using a rectangular plot with a size of 1 x 1 m and then the data were analyzed using the formula SDR. The results obtained are 21 species of weeds that grow at the age of 0 WAP (before if the land), 4 WAP (before application Paclobutrazol) and 8 WAP (after application Paclobutrazol). Dominace most in before if the land is Pennisetumpurpupoides with a value of SDR 41.10%, in the period of 4 WAP Chips are Ageratum conyzoides L dominace's with a value of SDR 24.58% and weeds Setariabarbata land dominace's research in the period 8 WAP Chips with value SDR 26.78%.

Keywords— types, SDR, dominance, weeds, potatoes.

I. INTRODUCTION

Potatoes are the main food crop 4th in the world after wheat, rice, and corn [1] is also one of the commodities horticultural crops the main vegetables world that have the potential to be developed as a source of carbohydrate in order to support the diversification program food [2]. Nutrient content per 100 grams of potato tuber ie 2 g protein, 0.1 g fat, 19.1 g carbohydrates, 11 mg calcium, phosphorus 50 mg, iron 0.7 mg, fiber 0.3 g, 0.09 mg vitamin B1 , vitamin C 16 mg and calories 83 cal[3].

Indonesia potato production can only meet 10% of the national potato consumption, ie 8.9 million tonnes per year [4], whereas the intensive cultivation of potato productivity can reach more than 35 tons / ha. According to Central Bureau of Statistics Indonesia [5] the productivity and the production of potato Indonesia in 2014 and 2015 respectively was 17.67 tons / ha (1,347,815 tons) with total area of 76 291 ha and 18.20 t / ha (1,219,269 tons) with total area of 66 983 hectares.

In the potato plant maintenance can not be separated from weed control, because of the presence of weeds in potato crop is often regarded as one of the causes of the decline in the results of the potatoes. The yield reduction is highly dependent on the type of weed, density, time of competition, as well as compounds that issuedalelopati by the weeds. As a result of the decline occurring is yield loss can exceed the yield losses caused by pests and diseases in plants.

According Kastanja[6], many factors can affect the type and diversity of weeds in an area, such as soil type, technical culture, and altitude. Sembodo[7] stated that the high technical culture will affect the low competitiveness of weeds on crops. Further, he said the density of weeds on agricultural land varies according to the season. During the rainy season, water supplies enough that the weed population increases and vice versa.

Land of potatoes grown conventionally, weeds growing on the land can be controlled through tillage and weeding, but these control activities require time, effort and cost is enormous. Inhibiting Substance Usage Growing considered a solution to weed control in addition to saving time and labor, it also saves the cost incurred for such activities. The purpose of this study is to determine the effect of plant growth regulatorPaclobutrazol and dominance against this type of weeds in potato fields.

II. MATERIALS AND METHODS

2.1 Implementation Research

This research was conducted in June-September 2018, in field trials Institute for Agricultural Technology (BPTP) West Sumatra Sukarami located in Solok, West Sumatra with altitude of ± 928 m above sea level. The method used

to identify the types of weeds are squares method to create a sampling frame using a rope with a size of 1 x 1 m at 0 WAP (at the time if the land), 4 WAP (before giving Paclobutrazol) and 8 WAP (after giving Paclobutrazol) Research this was conducted in June-September 2018, in field trials Institute for Agricultural Technology (BPTP) West Sumatra Sukarami located in Solok, West Sumatra with altitude of ± 928 m above sea level.

2.2 Data analysis

To determine the dry weight of weeds, weeds example from the field is cleaned, then dried by the oven for 2 x 24 hours with a temperature of 60℃. Weeds that have been dried tersebutnya weighed to determine dry weight of each species. After the calculated frequency of each species squared plot. The next of these indicators are calculated relative frequency, relative density, relative dry weight and value summed Dominance Ratio (SDR)

   a. The density of a kind (KM)

$$KM = \frac{Jumlah\ individu\ suatu\ jenis}{Luas\ petak\ contoh}$$

   b. Relative density (KR)

$$KR = \frac{Kerapatan\ suatu\ jenis}{Kerapatan\ semua\ jenis}\ x\ 100\%$$

   c. The frequency of a particular type (FM)

$$FM = \frac{Jumlah\ petak\ ditemukan\ suatu\ jenis}{Jumlah\ seluruh\ petak\ contoh}$$

   d. The relative frequency (FR)

$$FR = \frac{Frekuensi\ suatu\ jenis}{frekuensi\ seluruh\ jenis}\ x\ 100\%$$

   e. Biomass is a type (BM)

$$BM = \frac{Biomasa}{Luas\ petak\ contoh}$$

   f. Relative biomass (BR)

$$BR = \frac{biomasa\ suatu\ jenis}{biomasa\ serelatif\ semua\ jenis}$$

   g. Dominance summed Ratio (SDR)

$$SDR = \frac{KR+FR+BR}{3}$$

III. RESULTS AND DISCUSSIOND

3.1 Type Weeds

The results of the analysis of vegetation of weeds in before if the land, period 4 WAPand 8 WAP found as many as 21 species of weeds such as; 10 species of weeds in before if the land (Table 1), 13 species of weeds in 4 WAP period (before application Paclobutrazol) (Table 2) and 12 species of weeds in a period of 8 weeks after planting (after application Paclobutrazol) (Table 3).

Table 1. Identification of Weeds in Potato 0 WAP

No.	Family	Species	Indonesian name
1	Asteraceae	*Bindens leucorrhiza*	Ajeran
2	Poaceae	*Pennisetum purpupoides*	Rumput gajah
3	Asteraceae	*Ageratum conyzoides* L.	Babadotan
4	Fabaceae	*Mucuna bracteata*	Sengon
5	Rubiaceae	*Oldenlandia corymbosa*	Rumput mutiara
6	Fabaceae	*Crotalaria striata*	Orok-orok
7	Fabaceae	*Mimosa pudica*	Putri malu
8	Euphorbiaceae	*Euporbia heterophylla* L	Katemas
9	Verbenaceae	*Stachytharpheta jamaicensis*	Pecut kuda
10	Asteraceae	*Crassocephalum crepidioides* (Benth)	Sintrong

Table 2. Identification of Weeds in Potato 4 WAP

No.	Family	Species	Indonesian name
1	Asteraceae	*Bindens leucorrhiza*	Ajeran
2	Asteraceae	*Ageratum conyzoides* L.	Babadotan
3	Fabaceae	*Mimosa pudica*	Putri malu
4	Euphorbiaceae	*Euporbia heterophylla* L	Katemas
5	Poaceae	*Setaria barbata*	Bulu rubah
6	Poaceae	*Enchinochloa colona*	Rumput bebek
7	Poaceae	*Cynodon dactilon*	Rumput griting
8	commelinaceae	*Ottochloa nodosa*	Gedong puser
9	Graminae.	*Brachiria humidicola*	Rumput bede
10	Araceae	*Colocasia esculenta* L.	Talas
11	Rubiaceae	*Borreria latifolia*	Rumput setawar
12	Compositae	*Galinsoga quadriradiata*	Bribil
13	Cyperaceae	*Cyperus cyperoides*	Pako

Table 3. Identification of Weeds in Potato 8 WAP

No.	Family	Species	Indonesian name
1	Asteraceae	*Bindens leucorrhiza*	Ajeran
2	Asteraceae	*ageratum conyzoides* L.	Babadotan
3	Rubiaceae	*Oldenlandia corymbosa*	Rumput mutiara
4	Fabaceae	*Crotalaria striata*	Orok-orok
5	Fabaceae	*Mimosa pudica*	Putri malu
6	Euphorbiaceae	*Euporbia heterophylla* L	Katemas
7	Poaceae	*Setaria barbata*	Bulu rubah
8	Fabaceae	*Brachiria humidicola*	Kaliandran
9	Rubiaceae	*Borreria latifolia*	Rumput setawar
10	Cyperaceae	*Cyperus cyperoides*	Pako
11	Poaceae	*Elusin indica*	Rumput belulang

3.2 SDR

The results of the analysis of vegetation of weeds in before if the land, period 4 WAP and 8 WAPfound as many as 21 species of weeds such as; 10 species of weeds on land though Prior, 12 weed species in the period 4 WAP potato plants and 12 species of weeds in potato crop period 8 WAP (Table 4).

Table 4. The value of SDR various weed species identification results before if the land, 4 WAP and 8 WAP

Weeds name's	Classification of Weeds	SDR (%)		
		0 WAP	4 WAP	8 WAP
Bindensleucorrhiza	Broadleaf	15.01	17.05	14.56
Pennisetumpurpupoides	Grass	41.10		
*ageratum conyzoides*L.	Broadleaf	9.53	24.58	19.21
Mucuna bracteate	Broadleaf	6,90		
Oldenlandiacorymbosa	Grass	4.12		1.46
Crotalaria striata	Broadleaf	5.67		3.67
Mimosa pudica	Broadleaf	2.03	1.20	1.28
*Euporbiaheterophylla*L.	Broadleaf	2.00	6.82	3.17
Stachytharphetajamaicensis	Broadleaf	10.42		2
Crassocephalumcrepidioides (Benth)	Broadleaf		3.23	
Setariabarbata	Grass		14.62	26.78
Enchinochloacolona	Grass		11.80	
Cynodondactilon	Grass		1.20	
Ottochloa nodosa	Broadleaf		1.34	
Brachiriahumidicola	Grass		5.29	5.43
Colocasia esculenta (L.)	Broadleaf		2.52	
Borrerialatifolia	Broadleaf		10.37	16.86
Galinsogaquadriradiata	Broadleaf		1.26	
Cyperuscyperoides	Credits		1.96	1.58
Elusinindica	Grass			2.02
Cyperusrotundus	Credits			3.99
Total		100	100	100

Pennisetum purpupoides otherwise known as the king of grass weeds dominate in the research area before the land though, it is suspected the farmers around the area of research with king deliberately planting grass for animal feed. During the rainy season, fodder crops grow, so available in abundance so the king of grass is almost up about half of the land if the study at the time before the land. According Suyitman [8] king grass is a very potential fodder given to include livestock ruminants. This grass is a hybrid between an elephant grass (*Pennisetum purpureum*) with Barja grass (*Pennisetum thypoides*). King grass is a perennial plant (perennial), grow upright form clumps. Roots in, looks similar to sugarcane, height 2-4 m, and if allowed to grow upright can reach 7 m,

Besides Pennisetum purpupoides more dominant weeds found in before if the land is Bindens leucorrhiza and Stachytharpheta jamaicensi. Bindens leucorrhiza has a value of SDRs amounted to 15.01% and Stachytharpheta jamaicensi has a value of SDRs amounted to 10.42%. Both of these weeds manifold broadleaf weeds.According Sumekar et al. [9] generally makes a broadleaf weed species are able to produce abundant seed number so it is difficult to control. This weed grows large habitus, so the competition is going on with plants, especially in terms of getting light [10].

Weeds that have the smallest dominance value based on the value of SDR 2% before if the land is *Euporbia heterophylla.* Is classified as a weed broadleaf weeds suspected Euporbia heterophylla it less competitive with king high grass and overgrown weeds cover Euporbia

heterophylla so less gets light so underdeveloped. According Hayata et al. [11]*Euphorbia*able to bloom throughout the year so that reproduction and development was rapid, like the soil slightly moist, somewhat tolerant with ternaung atmosphere. In addition, because the study area includes plains (57 m asl) so Euphorbia hirta is able to grow well because these weeds live and spread the altitude 0-1400 m asl.

Other broadleaf weeds *ageratum conyzoides* L found to be most dominant in the period of 4 WAPKentangdengan SDR value of 24.58%. Weed *Ageratum conyzoides* is one kind of weed of the family Asteracea. *Conizoides ageratum* L. is an annual weed that is commonly found on farms and plantations in the lowlands to an altitude of 3,000 m above sea level. This type of flowering weeds throughout the year and is able to produce up to 40,000 seeds / plants that are easily dispersed by wind and water flow [12]. Knuuttila [13] states that the seeds - seeds of weeds and organs - vegetative organs such as risoma dormant in the soil will do regrowth under appropriate conditions. It is usually characterized by an increase in soil temperature and quality of the sunlight. According to Caton et al. [14], *Ageratumconizoides*L. a shade-tolerant weeds, can occur throughout the entire season, responsive to fertilizer,

Further more mendominance weeds in 4 WAP period after *ageratum conyzoides* is *Bindens leucorrhiza* the SDR value of 17.05 and Setaria barbata with SDR value of 14.62%. Setaria barbata SDR value increased 8 WAP period amounted to 26.78% and most mendominance among other gulama. Setaria barbata is a livestock animal feed ingredients that grow abundantly in the rainy season. Anticipated increase in SDRs on 8 WAP period is due to the high rainfall increased so Setaria barbata SDRnya value. After *Setaria barbata* found weeds *Ageratum conyzoides*L still mendominance on research fields at 8 WAP period with a value of SDR 19.21%. This period of dominance of weeds *Ageratum conyzoides* L decreased compared to the previous period. Unlike the weeds also mendominance at 8 WAP Borreria latifolia period increased from the previous period (4 WAP) which has a value of SDR 16.86% with an increase of 6.49%.

Weeds that have the lowest SDR value of 1.2% is *Cynodon dactilon* and *Mimosa pudica* in the period of 4 weeks after planting. Whereas in a period of 8 weeks after planting potatoes, weeds Oldenlandia corymbosa has the lowest SDR is 1.28%. According toMercado [15], changes in weed species because of a difference in crop management, including water management and fertilization as well as differences in morphological characters of plant constituent components that can alter

microclimates planting environment giving rise to the different responses of each weed species.

The most dominant weed species found on land if the land prior research, 4WAP and the period 8 WAP Potato Chipsis a kind of broadleaf weeds and grasses. Dominace most in before if the land is Pennisetum purpupoides with a value of SDR 41.10%, in the period of 4 WAPpotatoes are *ageratum conyzoides* L mendominance with a value of SDR 24.58% and weeds Setaria barbata land mendominance research in the period 8 WAPPotatoes with a value of SDR 26.78%(Picture 1).

A   B   C

Fig.1: Weed dominant in before if the land, 4WAP and 8 WAP: (A) Pennisetum purpupoides (B) weeds Ageratum conyzoidesL and (C) weeds Setaria barbata
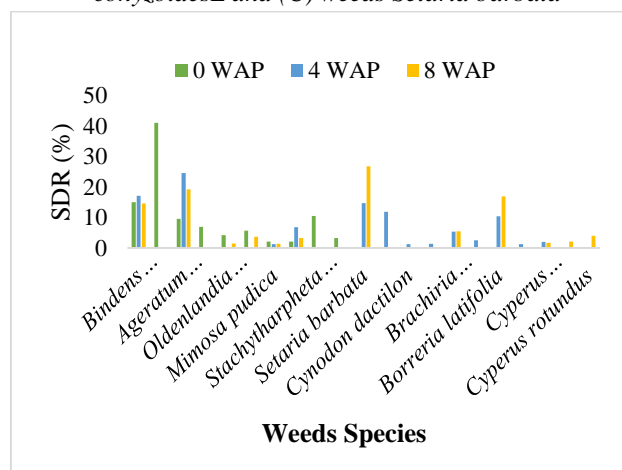

Fig.2: Bar chart value of SDR

Judging from the value of the SDR in the period 4 WAP and 8 WAP weeds*Setaria barbata, Brachiria humidicola, Borreria latifolia* and Cyperus cyperoisdes firstly not found in prior if the land grows well in periods 4 WAP and 8 WAPChipsit is suspected at the time of land preparation are initially dormant weed seeds, germinated due to the reversal of land that grows and develops.In accordance with the statement Paiman et al. [16] on agricultural lands many types of weeds whose seeds immersed enough in the result of the processing of the soil. The lifting of weed seeds to the top layer of surface soil and the availability of appropriate moisture for germination will encourage weed seeds to grow and thrive.

Judging from the development phase of cultivated plants, weeds do not have tocontrolled throughout the growth period of crops. Nietto et al. [17] stated that the

presence of weeds throughout the life cycle of plants is not always negatively affect crop production. There is a phase in which the crop is sensitive to the presence of weeds and weed presence in this phase can significantly degrade results, referred to as the critical period. At this critical period of weeds should be controlled in order to avoid competition which can lead to a decrease in plant productivity.

Many factors affect the diversity of weed communities among which are cropping patterns, and the different methods of weed control. Certain weed species are ecologically grow well in areas with a particular crop cultivation and dominate the cropping area of cultivation. Ecologically crop rotation can prevent the dominance of weed species or groups of certain weeds in crop cultivation area [9].

IV. CONCLUSION

The most dominant weed species found on land if the land prior research, 4WAP period and the period 8 WAP Potato Chipsis a kind of broadleaf weeds and grasses. Dominace most in before if the land is *Pennisetum purpupoides* with a value of SDR 41.10%, in the period of 4 WAPpotatoes are *ageratum conyzoides* L mendominance with a value of SDR 24.58% and weeds *Setaria barbata* land dominate research in the period 8 WAPpotato with value of SDR 26.78%

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