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The Effect of *Jussiaea Octovalvis* Weed Densities on the Growth and Yield of Several Introduced Vietnam Rice (*Oryza Sativa*) Varieties

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ABSTRACT

Rice is staple grain production that plays an important role in food security and the socio-economic value of agriculture in South East Asia countries. Among the factors that have negative effects on rice, weed is the major one. Its production constraint is directly seeded rice; besides, weed also affects rice growth and yield by competition about light, water, nutrient, space. *Jussiaea octovalvis* is a kind of weed in the field during rice growth to mature, which affects the growth and yield of rice but not significantly different based on this research. Treatments were arranged factorially in Randomized Block Design (RCBD) with two factors, 20 treatments (4 varieties, 5 of weed densities), and four replications, and each repetition used two pots for each treatment. As a result, the data showed the difference between the rate of growth and the yield of rice grain recovery products. Especially at data of LL 58 DAP showed significant difference ($P=0.017$), which the highest rate is 59.13 cm of V2; for harvest data showed that V3 is the best result, but it is also a sensitive one in the condition of weed densities impaction more than the others varieties ($D0V3=620.5$; $D4V3=438$). Besides, the measurement of W1000 of rice grain (30.96 g) and Wt per pot (20.01 g) of D0V3 is weight more than the other treatment; within D4V4 was obtained lowest of W1000 (19.26 g) and the lowest of Wt is D1V1 (5.25 g). Besides that, D2 and D4 are more effective on rice growth and yield, and it was non-significant. However, it is not the interaction between weed densities and varieties of rice.

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INTRODUCTION

Rice (*Oryza sativa*) is among the three most important grain crops in the world, and it has a major contribution to fulfill the food needs across the globe (Chauhan, Jabran, & Mahajan, 2017). In Viet Nam, rice is also important food and to export out the world. According to (Quang, 2017), Viet Nam is a country which the cultivated surface of rice is the sixth in the world with rice producing is 77.6 million ha and export rice out the world that value is achieved 2 billion USD every years. In 2017, follow Ministry of Industry and Trade example that year were successful of year of producing rice in Viet Nam with 5.52 million ton equivalent 2.49 billion USD (Quang, 2017). Specially, Mekong Delta region where is the largest of rice production in the Southern of Vietnam; which the most produce of varieties rice is routine planting such as OM 5451, OM 4900, Jasmine, OM6976, OM 9677, ect; these kind of varieties are famous with the high yield.

Beside that, Indonesia is the importer rice from others country and rice also is politically strategic commodity in Indonesia and the government seeks to ensure that rice production most the needs if domestic consumption is accordingly is interested for its performance in accordingly for its performance and in accordance with several determining factors. The estimates of the 2017 harvest in Indonesia have been lowered by 330.000 tons to 7.9 millions tons (Food and Agriculture Organization of The United Nations (FAO), 2018). However, in recent years total rice consumption has been rising faster than production, as the growth rate of national rice areas and yield has flattered. Thus, these increases would more than compensate for cuts in other traditional importers, namely in Indonesia (Food and Agriculture Organization of The United Nations (FAO), 2018). Productivity is related to be finding now high fielding rice varieties that potentially increase the yield per ha, stabilizing rice field by better management to prevent or to control pest and disease incidence, and post harvested; also the varieties rice. The efficiency of those methods for increasing rice production differ from one region to another region which this depends on the natural also social-economic conditions and also depend on which the kind of varieties; which the regularly of varieties (Indonesia) use such as Cisoka, IR – 64, Cere kuning, Cere unggul, ect.

There is improvement of rice yield we need to control the weed. And weed is as old as agriculture, from the very beginning farmers realized that the weed interference with crop production (Ghersa, Benech-Arnold, Satorre, & Martinez-Ghersa, 2000). Following (Chauhan & Johnson, Growth Response of Direct Seeded Rice to Oxadiazon and Bispyribac-Sodium in Aerobic and Saturated Soils, 2011), weeds are the greatest yield-limiting constraint to rice. The reason why weed make rice yield loss cause weeds compete with rice plants

severely for space, nutrients, air, water and light and thus adversely affecting growth and yield of rice (Singh *et al.*, 2007). In the other hand, weed population, period of weed competition, relative time of crop and weed emergence, crop and parts harvested, and growth habit and vigor of the weed effect losses caused by weed. From the others researcher, (Ramzan, 2003) showed in his study that weed could reduce rice yield up to 48, 53 and 74% in transplanted, direct seeded flooded and direct seeded, respectively. Beside that in tropical area, the average of rice yield losses from weeds is 35% (Oerke & Dehne, 2004). (Sunil, Shekara, Kalyanmurthy, & Shanmalingappa, 2010) research showed that season-long weed competition in rice cause of yield reduction up to 80%. On the other hand, reported from (Jayadeva, *et al.*, 2011) that complete failure of crops due to weeds in rice. However, effect of weeding regime on growth and yield performance of rice depends on many factors including growing season, weed pressure, competitiveness of variety, planting density, agronomic management and so on (Juraimi, Uddin, Anwar, Mohamed, Ismail, & Man, 2013).

Generally, weed competition during the early growing season usually depresses crop growth more than competition at other times such as *Monochoria vaginalis*, *Cyperaceae*, *Echinochloa Colona (L.)*, *Leptochloa chinensis*, *Jussiaea linitotia*, *Echinochloa crus-galli*, *Cyperus difformis*, *Jussiaea octovalvis* (the other name *Ludwigia octovalvis*), *ect*.

Ludwigia octovalvis octovalvis is a primary weed in the rice field, were found in lowland; it is the willowherb family (Onagraceae) and also is perennials weed (Naidu, 2012); it is widespread in Asia and *Jussiaea octovalvis* is found throughout the Tropics from sea level to 1500 m elevation (Cabi, Invasive Species Compendium, 2019). That also has high competitiveness with crop most commonly in either rainfed or irrigated rice fields (Caton, Mortimer, Hill, & Johnson, 2010). The study from (Dharmaratne & Ranamukaarachchi, 1991), which the result about the average height of rice varied from 48.1 to 49.4 cm and increased density of *Ludwigia* did not affect the height of rice during Maha. However, during Yala, the height of rice increased with increasing *Ludwigia* densities up to 16 plants/m² (Dharmaratne & Ranamukaarachchi, 1991).

In the view of the above opinion, the study was undertaken to find out how *Jussiaea octovalvis* weeding – is a one kind of weed which usually appear in paddy field - effect on growth and yield of several introduce varieties rice from Vietnam and compare with local rice in Padang, Indonesia.

MATERIALS AND METHODS

Study area, sampling

The study was conducted at Greenhouse at Andalas University and treatments were arranged factorially in

weed. Specially, for harvest data it was taken different time between different varieties because of growing time of each variety is different.

The study was using Excel, SPSS and Minitab software for analyzing data. Using comparative method of

Table 2. The interaction between WD and varieties rice which affect on number of leaf 72 DAP. Which is D0= non-weed, D1= one weed, D2= Two weeds, D3= three weeds, D4= four weeds.

Varieties	Weed densities per pot				
	Non-weed	One weed	Two weeds	Three weeds	Four weeds
OM 5451	14.35aB	13aB	13aB	15.13aB	14.88aB
OM 4900	16.88aB	14.38aB	14.38aB	16.6aB	14.75aB
Jasmine	24.5Aa	21.63Aa	21.63Aa	16.88Aa	18.13Aa
Cisokan	19.25Aa	16.85Aa	16.85Aa	21.38Aa	15.5Aa

Randomized Block Design (RBD) with 2 factors, 20 treatments (4 varieties – OM 5451=V1; OM 4900=V2; Jasmine=V3 and Cisokan=V4, 5 of weed densities – non weed=D0; one weed=D1; two weeds=D2; three weeds=D3 and four weeds=D4) and 4 replications, each replication used 2 pots - which are 22 cm (taller); 20 cm (bottom diameter); 29 cm (to diameter) – for each treatment and total 160 pots same with 1.68m³ of soil.

variance (ANOVA) and Tukey (Post-hoc) for comparing which is significant difference between treatments.

RESULTS AND DISCUSSION

Effect of weed densities on rice growth stage

Table 1. The interaction between WD and V, which affect on plant height (cm) at 72 DAP.

Varieties rice	Weed densities (per pot)				
	Non - weed	One Weed	Two weeds	Three weeds	Four weeds
OM 5451	88.66 abC	90.04 abC	83.54 bcC	87.38 abC	92.78abC
OM 4900	102.71 Aa	102.86Aa	94.66 Aab	100.93 Aab	102.91Aa
Jasmine	104.23 AaB	99.19 abB	98.94 aBb	94.85 aBb	93.6 aBb
Cisokan	96.89 AaBb	98.61AaBb	91.88 AaBb	99.51 AaBb	87.69AaBb
Sig	ns				
CV	7.1				

Data collection and statistical analysis

By using Standard Evaluation System for Rice (SES) from (Ampong-Nyarka & S.K), the data of growth and grain yield of rice were observed to tillering ability (number of tiller), plant height (cm), leaf number, leaf length (cm) for vigor stage; beside it were observed to grain yield of rice on panicles number, panicles length (cm), filled grain, un-filled grain, W1000 (g) (per pot), biomass (g). In addition, the data of this study were taken every week in every pots into research and started from the time rice had 3 leaves. For flowering time until harvest, that time stopped taking data for make sure that not have any destroy on yield by another factor without

Impaction on height rice (cm)

Basing on data in Table 1, increase WD did effect on the height of rice 72 DAP, but it was not significant (with $P=0.271>0.05$). As the result, weed is limited the rice height at treatment D1 that mean in the small space like pot. Weeds have stronger competitive with rice about nutrient. Especially, there is nitrogen (NO_3^-) from soil and fertilizer; effective N management aims to increase rice ability to compete with weedy rice variants (Olajumoke, Juraimi, Kamal, Husni, & Alam, 2015) and the research of (Awan, Chauhan, & StaCruz, 2014) told that high levels of N fertilizer improved crop growth

and yield over weed. And more, the Table 1 show that the height of rice in V3 reduced following WD increased (from 104.23 cm to 93.6); however for the other varieties the height of rice increased in one weed treatment (D1) and reduce when increase more than two weed per pot. That's mean the competition of weed is not only negative impact on rice, it is also positive impact in rice growth with the appropriation of WD. Generally, the reduction in growth cause by competition for light which is considered also for some weed species; that did not have competition for light between weed and rice on changing height of tiller (Chauhan & Johnson, Implication of Narrow Crop Row Spacing and Delayed Echinochloa colona and Echinochloa crus-galli Emergence for Weed Growth and Crop Yield, 2010); (Gibson & Fischer, 2001).

On the other hands, with the difference in varieties have differently WD impact on HT of rice and it was significant different ($P=0.000<0.05$). Based on the data in Table 1, it is also show the best stable development of height rice is V3 (Jasmine) – which is D0V3 treatment (104.23 cm). In addition, the both D2V1 and D2V4 of variableness of height rice that showed V1 and V4 are sensitive with weed (Table 1); also showed that V2 is the best adaptation in condition of weed densities impact. However, it depends on the differential morphological characters of each varieties properties play a vital role in crop-weed competition (Namuco, Cairns, & Johnson, 2009); (Ramesh & Chauhan, 2016).

Impaction on number of leaves of rice

Following the data in Table 2, the interaction both of varieties and increasing in WD at 72 DAP was not significant different. However, it had different between D0 and D3 at treatments of V1 and V4 what the data showed NOL of these varieties at D3 better than D0 and also better than the others treatment of WD. In the fact, that beginning from 72 DAP it is the early vigor stage of rice. In this stage, it does not have any growth of vegetative growth. Besides, the competition between weed and crop did not purely on NOL rice because competition for both nitrogen and light that happen strongest under condition of high fertility, competition for light was most important (Graf, Gutierrez, Rakotobe, Zahner, & Delucchi, 1990). Summary, not have interaction between WD and number of leaf of varieties

rice.

However, different varieties have varies of the number of leaves for each variety with significant different ($P<0.05$), it was showed in Table 2. The best one in V3; beside that the value of data from both of V1 and V4 is vary for each level of weed densities at 72 days ; it is also had the impact from the destroy tiller of larva *Scirpohaga incertulas* Walker from 51 DAP to 65 DAP. However, the competitive between weed – rice usually on light space and CO₂ that stimulation rice increased number of leaf for growing in weedy condition. In the other hand, in the reported from (Caton, Foin, & Hill, A Plant Growth Model for Integrated Weed Management in Direct – Seeded Rice. III., Interspecific Competition for Light. Field Crop Research 63 (1999)), the exception for a particular parameters and minor differences in phenology, weed growth processes are simulated exactly as for rice.

Impaction on the number of tiller of rice

As a result in Table 3, the more weed densities did not affect on number of tiller with non-significant ($P>0.05$) and it not had interaction between weed densities and varieties rice. The value of number tiller of rice are vary depend on each variety, which V1 and V4 showed the better growth of tiller in D3 treatment and V2 created more tiller in D2 treatment; however at V3 reduce the number of tiller following increased of WD. In there (Table 3), V1 and V4 is strongest of growth in competition of weed compete condition; so V3 was show how weed densities impact on growth at tiller stage. Thus, the number tiller efficiency is decided on the yield of rice.

Among these varieties, the development of tiller number was difference significant between four varieties with $P<0.05$ in table 3; with the best rate at V3 (3.73 tiller). That show V3 is strong in ability of adaptation with environment condition in Indonesia.

Table 3. The interaction between WD and varieties of rice which affect on the number of tiller at 72 DAP

Varieties	Weed densities				
	Non-weed	One weed	Two weeds	Three weeds	Four weeds
OM 5451	2.88 aB	2.25 aB	2.5 AaB	3 Aa	2.63 AaB
OM 4900	2.63 AaB	3.38 AaB	3AaB	3.25 AaB	3.13 AaB
Jasmine	4.63 Aa	4.5 Aa	3.88 Aa	3.5Aa	3.75Aa
Cisokan	3.5 Aa	3.5 Aa	3.63Aa	4.5Aa	3.5Aa
Sig	ns				
CV	35.6				

Note: ns non-significant; of interaction between varieties rice and weed densities at meaning of 5% ($P=0.868$). Mean followed by a similar letter in a row are not significant different ($P=0.587>0.05$) between five level of weed densities and A similar letter in the column A are significant different ($P=0.002<0.01$) between four varieties rice.

However, the best data of tiller number almost in D3 of each variety (Table 3); the same result from (Khan, Hasan, Anwar, & Islam, 2017). The highest number of effective tillers hill⁻¹ (10.48) was obtained from weed - free treatment and the lowest one (4.36) in no weeding

On the other hand, look at Table 4, that show the growing of V3 and V2 is better than others varieties with significant ($P < 0.05$). Following the research of (Juraimi, Uddin, Anwar, Mohamed, Ismail, & Man, 2013), the effect of weeding regime on growth of rice

Table 4. The interaction effect WD and varieties on leaf length of rice at 72 DAP. Which is D0= non-weed, D1= one weed, D2= Two weeds, D3= three weeds, D4= four weeds.

Varieties	Weed densities per pot				
	Non-weed	One weed	Two weeds	Three weeds	Four weeds
OM 5451	54.12aB	55.99aB	53.13 aB	53.93 aB	57.33aB
OM 4900	64.62Aa	64.02Aa	61.79Aa	67.11Aa	65.78Aa
Jasmine	67.16Aa	66.45Aa	64.08Aa	61.63Aa	64.35Aa
Cisokan	62.76Aa	62.75Aa	57.09a	67.04Aa	54.46Aa
Sig	ns				
CV (%)	9.1				

Note: ns non-significant of interaction between varieties rice and weed densities at meaning of 5% ($P = 0.868$). Mean followed by a similar letter in a row are not significant different ($P = 0.587 > 0.05$) between five level of weed densities and A similar letter in the column A are significant different ($P = 0.002 < 0.01$) between four varieties rice.

treatment.

Impact on leaf length of rice

As the result in Table 4, WD did not affect on leaf length at 72 DAP, with not significant and also not

depends on many factors including growing season, competitiveness of variety, planting density, agronomic management and more factors from environment and also from research of (Namuco, Cairns, & Johnson, 2009) told that different of cultivar rice their

Table 5. Interaction between weed densities and varieties rice show on the number of panicle of rice

Varieties	Weed densities				
	Non-weed	One weed	Two weeds	Three weeds	Four weeds
OM 5451	3.01abC	2.5bC	3.25abC	3.25abC	2.75bC
OM 4900	3.5aBbC	4.25aBbC	3.5aBbC	4.25aBbC	3.75aBbC
Jasmine	6.25Aa	5Aab	5Aab	4.75Aab	4.5Aab
Cisokan	4.5AaBb	5.25AaBb	4.5AaBb	5.5AaBb	4.25AaBb
Sig	ns				
CV	31.4				

Note: ns is non-significant at 5% meaning for each harvest data of each variety. Mean followed by a similar letter in a row are not significant different ($P = 0.844 > 0.05$) between five level of weed densities and A similar letter in the column are significant different ($P = 0.002 < 0.01$) between four varieties rice.

interaction between WD and varieties showed on leaf length value. Besides that, the figure show that did not have any effect on leaf length by increasing WD during 72 DAP with non-significant ($P > 0.05$). Based on the study from (Anwar, Juraimi, Samedani, Puteh, & Man, 2012) tell that weeds do not compete with crops throughout the growing season.

competitiveness with weeds have previously. In addition, the data that all of growth rate of leaf was obtained increase WD it is mean leaf length increase to compete about light and CO₂ for photosynthesis (Potter & Jones, 1977).

Effect of weed densities on yield of rice

Panicle number per paddy

Table 6. Interaction between weed densities and varieties rice show on the data of panicle length of rice

Varieties	Weed densities				
	Non weed	One weed	Two weeds	Three weeds	Four weeds
OM 5451	20.34 aBb	21.11 aBb	21.03 aBb	21.39 aBb	21.12aBb
OM 4900	22.84 Aab	23.5 Aa b	23.03 Aab	23.45 Aab	23.15Aab
Jasmine	24.26Aab	24.43Aab	24.41 Aab	24.65 Aa	24.23Aab
Cisokan	19.47Bb	21.45aBb	19.93 aBb	22.66 aBb	20.26aBb
Sig	ns				
CV	8.7				

Note: ns is non-significant at 5% meaning for each harvest data of each variety. Mean followed by a similar letter in a row are not significant different ($P=0.9834>0.05$) between five level of weed densities and A similar letter in the column are significant different ($P=0.002<0.01$) between four varieties rice.

As the result show in Table 5, the fluctuation of panicle number appeared when weed densities change from D0 to D4; and the PN almost reduce follow WD increase. The sensitive one with WD is V3, the PN decrease from 6.25 (D0) to 4.25 (D4) that show weed completion results in economic yield losses (Anwar, Juraimi, Samedani, Puteh, & Man, 2012) and in the fact of weed that the highest yield could be expected where crop plant densities and spatial uniformity were greater (Chauhan & Johson, Growth Reponse of Direct Seeded Rice to Oxadiazon and Bispyribac-Sodium in Aerobic and Saturated Soils, 2011); (Ni, Moody, & Robles, 2004); (Phuong, Denich, Vlek, & Balasubramanian,

varieties rice to WD competition. However, it was not significant different at 5% of meaning of statistics.

Among the varieties showed in Table 5, the number of panicle of each variety is significant different ($P=0.000<0.01$). The most amount of panicle at V3 panicle per rice bud and the lowest is V1 that show the effect of weeding regime on growth of rice depends on competitiveness of variety (Namuco, Cairns, & Johnson, 2009); (Juraimi, Uddin, Anwar, Mohamed, Ismail, & Man, 2013).

Panicle length of rice

As the result in Table 6, for each WD makes a change in

Table 7. The interaction of weed densities and varieties rice; also how weed densities affect on the total of Filled grain rice in different varieties.

Varieties	Weed densities				
	Non-weed	One weed	Two weeds	Three weeds	Four weeds
OM 5451	289.03aB	229.5 aB	241aB	277aB	264.5 aB
OM 4900	383.5Aa	477.75Aa	433.75Aa	434.5Aa	472.5Aa
Jasmine	620.5Aa	487Aa	474.5Aa	453.5Aa	438Aa
Cisokan	451.75Aa	486Aa	439Aa	416Aa	425Aa
Sig	ns				

Note: ns is non-significant at 5% meaning for each harvest data of each variety. Mean followed by a similar letter in a row are not significant different ($P=0.968>0.05$) between five level of weed densities and A similar letter in the column are significant different ($P=0.00<0.01$) between four varieties rice.

2005). Beside that, dependence on the adaptation ability which each variety rice that have varied in difference WD; the Figure 13 showed that. Summary, it is interaction of five level of WD and V3 showed in the figure which WD increasing made the number of panicle reduce; for other varieties it is not show the interaction between increased WD and reactive of

the length of panicle but there it is not significant difference of interaction between the WD and V and also not interaction ($P > 0.05$). However, increase WD is also increase panicle length of rice; the highest panicle length of D3V3 (24.65 cm) and the shortest is D0V4 (19.47 cm) (Table 6). In the research of Ampong-Nyarko and Datta (1991) showed weed infestations

Table 8. The interaction of weed densities and varieties rice; also how weed densities affect on the total of Un-Filled grain rice in different varieties.

Varieties	Weed densities				
	Non-weed	One weed	Two weeds	Three weeds	Four weeds
OM 5451	35.96ab	21.5b	22.5b	16.5b	25.75b
OM 4900	112ab	98.75ab	103.25ab	128.25ab	84.75ab
Jasmine	271.5a	218.75ab	205.5ab	210.25ab	240ab
Cisokan	52ab	105ab	59ab	223ab	129.25ab
Sig	ns				

Note: ns is non-significant at 5% meaning for each harvest data of each variety. Mean followed by a similar letter in a row are not significant different ($P=0.702>0.05$) between five level of weed densities and A similar letter in the column are significant different ($P=0.00<0.01$) between four varieties rice.

primarily constrain rice production by reducing grain yield. Yield reductions caused by uncontrolled weed growth throughout a crop season have been estimated to be from 44 to 96%.

In addition, it also showed each variety was affected the WD and had the significant difference ($P = 0.000$) (Table 6). Particular, V3 is the highest of panicle length 24.3 cm and the shortest is V4 20.76 cm; different varieties rice is different on competitive ability with weed (Namuco, Cairns, & Johnson, 2009); (Juraimi, Uddin, Anwar, Mohamed, Ismail, & Man, 2013).

and by causing lodging, removing all traces of the pigmented layer requires intense milling and results in decreased grain quality and lower milling rates (Ampong-Nyarko and De Datta, 1991).

Among these varieties rice had significant different ($P=0.00<0.01$) at filled and un-filled grain of rice; with the best one of filled grain is V3 and the lowest is V1; besides that the most of unfilled grain also is V3 and lowest is V1; following (Sunil, Shekara, Kalyanmurthy, & Sha nkaralingapa, 2010) that season-long weed competition in rice may cause yield reduction up to 80%

Table 9. The interaction of weed densities and varieties rice; also how weed densities affect on the W1000 (g) grain rice in different varieties.

Varieties	Weed densities				
	Non-weed	One weed	Two weeds	Three weeds	Four weeds
V1	24.52 e-i	25.19afgh	25.57 def	25.35 efg	25.54def
V2	27.59 a-e	27.21a-e	26.68 cde	27.09bcd	26.93 bcde
V3	30.69a	30.29ab	30.71a	29.87abc	28.96 abc
V4	23.02 fghi	21.78hij	21.89 ghij	20.9ij	19.26ij
Sig	ns				

Note: ns is non-significant at 5% meaning for each harvest data of each variety. Mean followed by a similar letter in a row are not significant different ($P=0.259>0.05$) between five level of weed densities and A similar letter in the column are significant different ($P=0.00<0.01$) between four varieties rice.

Filled and un-filled grain

Table 7 show that the number of unfilled grain and filled grain of rice is change - increased for unfilled grain and decrease for filled grain - when the WD increased, but not significant different (Table 7). The most of filled grain is D0V3 (620.5); which treatment D0V3 also is the most unfilled-grain, because of the attack from pests during the maturity stage of rice; weeds hamper rice harvesting and increase harvest costs through direct interference with the harvesting operation

and complete failure of crops due to weeds in rice (Jayadeva, et al., 2011).

Impact of weed densities on W1000 (g) of rice

The interaction of WD and V is not significant different about the both of W1000 of rice grain ($P=0.259>0.05$). However, at Table 9, increasing WD is also decrease W1000, with V3 is the best one. And decreases occurred when the *Ludwigia* plant density beyond 2 plants/m² (Dharmaratne & Ranamukaarachchi, 1991).

The reason that rice yield losses from water deficit depend on the severity and duration of the deficit, the maturity is the stage that rice in drought condition; rice and weeds differ in their tolerance for drought because of differences in their root distribution, root elongation rate, genetic tolerance for low water availability in plant tissue, and control of water loss through transpiration. C₄ weeds have lower water requirements than those of C₃ rice and are able to tolerate more drought stress than rice (Ampong-Nyarko and De Datta, 1991). However, the yield loss is also depend on many factors include the densities of weed, such as weed ecotype; the emergence time (weed and rice); rainfall in the paddy field; temperature (Renton and Chauhan, 2017; Zimdahl 2004).

Table 10. The interaction of weed densities and varieties rice; also how weed densities affect on the Biomass (g) data in different varieties

Treatments	Wfr (g)	Wdr (g)
D0V1	37.44a	7.48bCc
D0V2	53.20a	12.19aBbc
D0V3	62.46a	15.98Aa
D0V4	51.78a	10.43aBbCc
D1V1	34.76a	6.83Cc
D1V2	57.38a	12.61aBbc
D1B3	61.28a	15.11Aab
D1V4	38.73a	8.77aBbCc
D2V1	34.87a	7.54bCc
D2V2	43.52a	10aBbc
D2V3	58.38a	14.41Aabc
D2V4	38.59a	8.82aBbCc
D3V1	39.02a	8.48abCc
D3V2	44.7a	10.72aBbc
D3V3	48.74a	12.52Aabc

It is not have interaction between WD and varieties also not significant different showed on the value of biomass (the fresh and dry weight) ($P_{Wfr}=0.431$; $P_{Wdr}=0.510>0.05$). The Table 10 shows the value of D0V3 is the heaviest one (62.46 g of Wfr, 15.98 g of Wdr) and the lowest is D3V3 (Wfr 48.74 g) and D4V3 (Wdr 11.77 g). In general, rice dry matter yield were be reduced by 1 kg for every kilogram of weeds produced in the same area (Kweel Ampong-Nyarko and De Datta, 1991) Following Dharmaratne and Ramamukarchchi

(1991), dry weight of rice decreased (from 2,762 to 2,342 kg/ha), but the difference was not significant during mature; the decrease in rice dry matter could be due to the reduction in the LAI (leaf area index) and tiller number as a response to competition by *Ludwigia*. In addition, the data of Wfr and Wdr from V1 were the lowest data; the data of Wfr of rice (V1) increasing with increasing on WD (from D0 to D4 weedy per pot); it changes from 37.44 g to 40.44 g in the Table 10.

Nevertheless, different Wfr, Wdr have vary of data, it decreased form non-weedy (7.84 g) to one weedy (6.83 g), after that increasing from 6.83 g (D1V1) to 8.82 g (D3V1) and decreased at D4V1 (8.35 g) (Table 10 and 11).

CONCLUSIONS

The study was investigative the effect of weed densities on growth and yield of introduce several Vietnam varieties rice with the condition in Padang. The result of study explained that and also not interaction between WD and varieties showed on growth stage of rice (tiller height, number of tiller, number of leaf). However, on data of leaf length at 58 DAP showed significant difference ($P=0.017$); all of growth rate of leaf was obtained increase WD it is mean leaf length increase to compete about light and CO₂ for photosynthesis. Beside the growth of rice, harvest data also are not significant different of statistical in interactive between WD and varieties rice, but it has different in data. In short, V3 showed the best data of harvest and medium of growth data. In addition, the study explain in each treatment of weed not impact on growth stage of rice; but it is have an impact on harvest value (W1000, FG, UFG), due to increasing WD (non - weed to four weeds per pot) the yield of rice reducing too which D2 and D4 are more effective on growth and yield of rice, however it was non – significant. All the measurements of harvest showed significant differences among groups of varieties rice, while variation due to interaction between WD and variety was not significant. And it is same case for the measurement about growth rate of interaction between WD and varieties rice in the study. The extent of crop loss caused by weeds depends on several factors that include species of weeds present, density of weeds and crop, duration of weed-crop association, and growth and distribution of weeds.

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