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Respond of the Growth and Production of Local Upland Rice Cultivars Sultra to the WateringVolume

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A B S T R A C T

The purpose of the study was to find out the respond growth and production of local upland rice Sultra's on the watering volume. The research was conducted in green house sized 4x10 m, from April to August 2015. This study tested four (4) cultivation local upland rice Sultra in the pot and treated with sub-optimum and optimal water levels of 25%, 50%, 100% and 150%. The experiment was conducted by using factorial desing of two factors of randoming complete block design (RCBD) with three replications, where first factor is W (water level) is comprised of four levels; W1 (25%), W2 (50%), W3 (100%), and W4 (150%). Second factor is cultivars upland rice local comprised of four levels; V1 (cultivar pae dai Ngalaru), V2 (cultivar pae Uba), V3 (cultivar pae Bou) and V4 (cultivar pae Bandoeha). The parameter observed were t plant height of the number of maximum tiller, number of leave, dry weight, dry weight of root, number of productive tiller, days to flowering, weight of 1000 rice, number of grain per tiller, the percentage of empty grain per tiller (%), blossoming age, and number of dry grain per tree

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INTRODUCTION

Rice is a staple food for most of the Asian population, especially Southeast Asia. In Indonesia, rice is the main staple food, followed by corn and cassava (manioc). Around 90% of rice production and consumption is in Asia. The problem of rice availability is often a problem that is quite worrying, because apart from the change in the function of agricultural land to non-agricultural land, it is also due to the emergence of new problems in recent times, such as the long dry season which causes delays in the planting season.

The need for rice in Southeast Sulawesi increases every year along with the increase in population. Based on data from the Central Statistics Agency for Southeast Sulawesi Province (2014), the average upland rice production in Southeast Sulawesi relatively increased, namely in 2011 upland rice production reached 25,034 tons of dry milled grain with a harvest area of 8,175 ha, then in 2012 it increased to 28,780 tons. Milled Dry Grain with a harvest area of 9,986 ha, and in 2013 this increased to 32,121 tonnes of Milled Dry Grain with a harvest area of 10,243 ha, which means an increase of 3,341 tonnes compared to production in 2012. The increase in production in 2013 occurred due to an increase in harvested area of 257 ha and productivity increased by 0.25 ton ha-1 (8.67%).

However, rice development on dry land in Southeast Sulawesi faces various obstacles, including because water availability is a factor in plant growth and production. Efforts to overcome this problem include implementing the right planting time to ensure sufficient water supply from the vegetative phase to the reproductive phase, and selecting plant cultivars that are tolerant of water shortages.

In conditions of water shortage, there will be a decrease in plant photosynthesis due to a decrease in leaf potential pressure, metabolic activity, number of leaves and leaf area. The decrease in metabolic activity is not only caused by a decrease in the number and area of leaves, but also due to the closure of stomata, causing a decrease in biomass (Rumani, 2003). The higher water stress results in lower transpiration and increased leaf diffusion (Sutoro and Somadiredjo, 1989).

Upland rice is generally planted on dry land once a year at the start of the rainy season. The low production of upland rice is also due to the fact that many people still plant dry land with long-lived local varieties of upland rice. This upland rice variety has several weaknesses, such as not being resistant to lodging, falling easily, having low yields and generally being less tolerant of drought (Prasetyo, 2002).

Research Objectives: To determine the effect of the interaction of water volume and cultivar, the effect of water conditions, and the effect of cultivar on the growth and production of local upland rice.

LITERATURE REVIEW

The rice plant (Oryza sativa L.) belongs to the Angiospermae division, monocot class, Graminae family and Oryzae subfamily. Based on its morphology, rice can be classified into three subspecies, namely Indica, Japonica and Javanica. Meanwhile, based on height, rice can be classified into two, namely tall rice (1.7 m high) and short rice (1 m high) (Katayama, 1993).

Framework Thinking

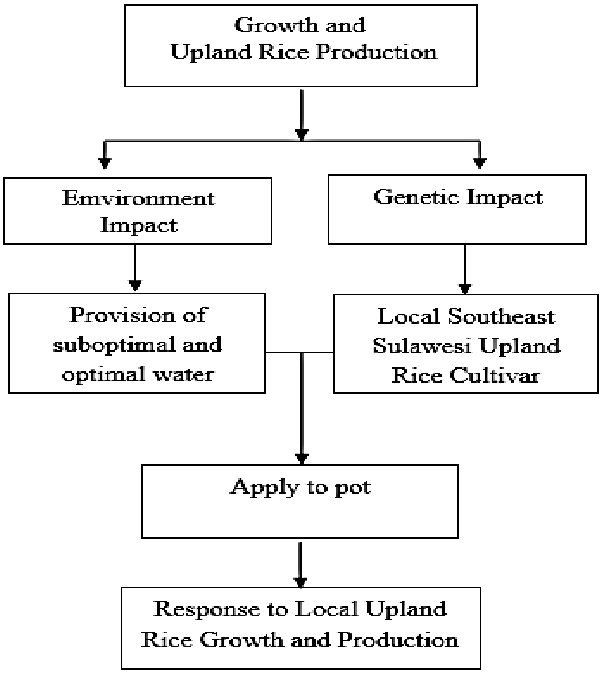

Figure 1. Conceptual Framework

Based on the framework above, the following hypothesis is put forward;

1. There is an interaction effect between water volume and cultivar on the growth and production of local upland rice.
2. There is a water volume treatment that has a better influence on the growth and production of local upland rice cultivars.
3. There is an influence of upland rice cultivar treatment on the growth and production of local upland rice.

METHODOLOGY

The research was carried out at the UHO Faculty of Agriculture Practice Field in a 4 x 10 m plastic house, from April to August 2015. The research tested 4 local SULTRA upland upland rice cultivars in pots and were treated with sub-optimal water conditioning and optimal water with a level of 25 %, 50%, 100% and 150%.

The materials used are cultivars (pae dai Nggalaru, pae Uba, pae Bou, and pae Bandoeha), topsoil, German NPK fertilizer, urea fertilizer, water, while the tools used are a pot measuring 25 cm x 30 cm, label, hoe, machetes, shovels, wooden stakes, raffiah rope, cameras, stationery, rulers, laptops, roller meters, paranets and plastic, ordinary scales and analytical scales, spatulas and temperature thermometers. The experiment was carried out using a two-factor factorial design with the RAKL pattern with three replications, where the first factor is the W factor (water volume which consists of four levels, namely W1 (25%), W2 (50%), W3 (100%), and W4 (150%). The second factor, namely upland rice cultivar, consists of four (4) levels, namely V1 (Ngalaru cultivar), V2 (Uba pae cultivar), V3 (Bou pae cultivar) and V4 (Bandoeha pae cultivar). Each experimental unit consists of 2 pots so the total pots in the experiment are 48 x 2 = 96 pots.

Types of observations and observation times include: Plant height (cm), measured at 70 days after planting (DAP), Number of productive tillers calculated just before harvest, Plant Biomass of roots, stems, leaves. The flowering age is determined when panicles from a number of tillers have emerged, the harvest age is calculated at the time of harvest, the weight of 1000 grains is calculated after harvest, the number of permalai grains is calculated after harvest. Permalai Filled Grain Percentage (%) is calculated after harvest, Perlumpun Dry Grain Yield is calculated after harvest

The data obtained were analyzed using the F test (Sydic variance) to determine the level of significance of each treatment factor and its interaction with the observed variables using the SAS application. If there is a significant difference then proceed with the Duncan Multiple Distance Test at the 95% level (UJBD 0.05).

RESULTS AND DISCUSSION

1. Plant Height

Observations of plant height and diversity characteristics at 70 DAT are presented in Appendix 1a to 1b. The interaction effect of water conditions and local upland rice cultivars as well as the results of the Duncan's multiple distance test (UJBD) 70 DAP are presented in Table 5.1.

Table 1. Effect of Interaction Between Water Conditions and Cultivar on Upland Rice Plant Height At 70 DAT (Cm)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	137.70 a	146.667 a	153.250 a	142.000 a	**144.917**	2=14.282
	q	pq	p	pq		3=14.888
Pae uba	152.583 a	143.000 a	133.167 bc	138.083 ab	**141.708**	4=15.297
	p	pq	q	pq		
Pae bou	122.083 b	133.833 a	118.917 c	124.667 b	**124.875**	
	p	p	p	P		
Pae bandoeha	147.250 a	142.417 a	139.083 ab	129.500 ab	**139.563**	
	p	pq	pq	q		
Rerata	**139.917**	**141.479**	**136.104**	**133.563**		

Note:

Numbers followed by letters that are not the same in the same column (a-c) and the same row (p-q) are significantly different at UJBD 0.05

Table 5.1 shows that 100% water conditions and the Pae Dai Ngalaru cultivar (W3V1) gave the best results for the average plant height at 70 HST which was significantly different from 25% water conditions and the Pae Dai Ngalaru cultivar (W1V1), 150% water conditions and the Pae cultivar. dai Ngalaru (W4V1), 100% water condition and Uba pae cultivar (W3V2), 100% water condition and Bou pae cultivar (W3V3) and 100% water condition and Bandoeha cultivar (W3V4) but not significantly different from 50% water condition and Ngalaru pae dai cultivar (W2V1).

This shows that plants whose water requirements are sufficient during growth will carry out physiological processes optimally so that plant morphological growth is optimal. Plants that experience a water deficit or surplus during their growth period will experience growth inhibition because water plays an important role in the process of organ formation, photosynthesis which is used to form food for plants.

2. Number of Leaves

Observations on the number of leaves and plant diversity at 70 DAT are presented in appendices 2a to 2b. The effect of the interaction of water conditions and local upland rice cultivars on the number of plant leaves and the results of Duncan's multiple distance test (UJBD 70 HST are presented in Table 5.2.

Table 2. Effect of Interaction Between Water Conditions and Cultivar on The Number of Leaves of Upland Rice Plants At 70 DAP (Strands)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	5.583 a	5.417 b	5.750 a	5.333 ab	**5.521**	2=0.575
	p	p	p	p		3=0.599
Pae uba	5.667 a	6.417 a	5.667 a	5.750 ab	**5.875**	4=0.616
	q	p	q	q		
Pae bou	5.750 a	5.917 ab	5.333 a	5.917 a	**5.729**	
	p	p	p	p		
Pae bandoeha	6.083 a	5.667 b	5.500 a	5.250 b	**5.625**	
	p	pq	pq	q		
Rerata	**5.771**	**5.854**	**5.563**	**5.563**		

Note: Numbers followed by letters that are not the same in the same column and row (a-f) are significantly different at UJBD 0.05

Table 2 shows that 50% water conditions and the Uba pae cultivar (W2V2) gave the best results for the average number of plant leaves at 70 DAT which were significantly different from 25% water conditions and the Uba pae cultivar (W1V2), 100% water conditions and the Uba pae cultivar (W3V2), 150% water conditions and Uba pae cultivar (W4V2), 50% water conditions and Ngalaru pae dai cultivar (W2V1), 50% water conditions and Bou pae cultivar (W2V3) and 50% water conditions and Bandoeha cultivar (W2V4).

The results of the research showed that the average number of leaves of the Uba pae cultivar at 50% water conditions gave the highest yield compared to other cultivars in this study at all water conditions treated. The Uba pae cultivar showed a positive interaction with 50% water conditions because the Uba pae cultivar, which had a fairly low number of leaves at 25%, 100% and 150% water conditions, experienced an increase in the number of leaves when at 50% water conditions. The availability of sufficient water at each phase of plant growth will support increased growth of the vegetative parts of the plant when compared to plants that lack or excess water.

3. Number of puppies

Observations on the number of saplings and plant variety characteristics at 70 DAT are presented in appendices 3a to 3b. The effect of the interaction of water conditions and local upland rice cultivars on the number of plant leaves and the results of the Duncan's multiple distance test (UJDB) 70 DAP are presented in Table 3.

Table 3. Effect of Interaction Between Water Conditions and Cultivar on The Number of Tillers in Upland Rice Plants At 70 DAP (Saplings)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	12.250 b	15.083 a	12.667 b	16.250 a	**14.063**	2=4.078
	p	p	p	p		3=4.251
Pae uba	9.833 b	12.417 a	13.250 b	12.500 a	**12**	4=4.368
	p	p	p	p		
Pae bou	17.583 a	16.167 a	21.167 a	16.250 a	**17.792**	
	pq	q	p	q		
Pae bandoeha	13.000 a	13.417 a	13.167 b	14.500 a	**13.521**	
	p	p	p	p		
Rerata	**13.167**	**14.271**	**15.063**	**14.875**		

Note: Numbers followed by letters that are not the same in the same column (p-q) and the same row (a-b) are significantly different at UJBD 0.05

Table 5.3 shows that 100% water conditions and the Pae Bou cultivar (W3V3) gave the best results regarding the average number of plant seedlings at 70 DAT which were significantly different from 25% water conditions and the Pae Bou cultivar (W1V3), 50% water conditions and the Pae Bou cultivar. (W2V3), 150% water condition and Bou pae cultivar (W4V3), 100% water condition and Ngalaru pae dai cultivar (W3V1), 100% water condition and Uba pae cultivar (W3V2) and 100% water condition and Bandoeha cultivar (W3V4).

This shows that genetically this cultivar has an advantage over other cultivars in terms of maximum number of tillers, thus influencing the number of tillers formed. This is thought to be the ability of the pae Bou cultivar to adapt to the environment and have the ability to maximize the absorption of sufficient amounts of available water.

4. Header Dry Weight

Observations of canopy dry weight and plant variety characteristics at 70 DAT are presented in appendices 4a to 4b. The influence of local upland rice cultivars on plant canopy dry weight and the results of the Duncan multiple distance test (UJDB) 70 DAP are presented in Table 4.

Table 5.4 Independent Influence of Cultivar on Shoot Dry Weight of Upland Rice Plants At 70 DAT (G)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	75.67	90.37	87.03	105.1	**89.54 ab**	2=12.12
Pae uba	94.53	94.37	88.03	109.33	**96.57 a**	3=12.74
Pae bou	77.12	88.03	86.93	72.03	**81.03 b**	4=13.14
Pae bandoeha	72.07	78.4	90.6	75.57	**79.16 b**	
Rerata	**79.85**	**87.79**	**88.15**	**90.51**	**86.57**	

Note: Numbers followed by letters that are not the same in the same column (a b) are significantly different at UJBD 0.05

Table 5.4 shows that the Uba pae cultivar (V2) gave the best results regarding the average dry weight of plant shoots at 70 DAP which was significantly different from the Bou pae cultivar (V3), Bandoeha cultivar (V4), but not significantly different from the Ngalaru cultivar (V1). . The Dai Ngalaru cultivar (V1) was not significantly different from the Pae Bou cultivar (V3) and the Bandoeha cultivar (V4).

This shows that genetically the tested cultivars respond differently to the same environment in terms of dry weight of rice shoots and can adapt well so that they can influence dry weight of shoots. This situation encourages the metabolic processes that occur in the plant body to increase, including photosynthesis, resulting in a higher rate of photosynthesis. The more photosynthate that is formed, the more photosynthate will be produced and the dry weight of the plant will be higher.

5. Root Dry Weight

Observations of root dry weight and plant variety characteristics at 70 DAT are presented in appendices 5a to 5b. The independent influence of water conditions and local upland rice cultivars on plant canopy dry weight as well as the results of the 70 DAP Duncan multiple distance test (UJDB) are presented in Table 5.

Table 5. Independent Influence of Cultivar and Water Conditions on Root Dry Weight of Upland Rice Plants 70 DAT (G)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	36.47	44.83	55.6	55.6	**48.13 a**	**2=8,01**
Pae uba	40.57	48.27	61.93	67.2	**54.49 a**	**3=8,41**
Pae bou	30.63	45.2	49.03	37.2	**40.52 b**	**4=8,68**
Pae bandoeha	33.47	59.77	38.47	42.43	**43.53 ab**	
Rerata	**35.28 b**	**49.52 a**	**51.26 a**	**50.61 a**	**46.67**	

Note: Numbers followed by letters that are not the same in the same column (a-b) are significantly different at UJBD 0.05

Table 5.5 shows that the 100% water condition (W3) gave the best results for the average dry weight of plant roots at 70 DAP which was significantly different from the 25% water condition (W1) but not significantly different from the 50% water condition (W2) and the water condition. 150% (W4). Pae Uba cultivar (V2) gave the best results in terms of average dry weight of plant roots at 70 DAP which was significantly different from Pae Bou cultivar (V3), but not significantly different from Dai Ngalaru cultivar (V1) and Pae Bandoeha cultivar (V4). The Bandoeha cultivar (V4) was not significantly different from the Pae Bou cultivar (V3).

This shows that the dry root weight decreased significantly in all cultivars because it was influenced by the genetic characteristics of each cultivar. From the results of this research it is known that there is a tendency, the dry weight of the roots will decrease with decreasing water content.

6. Number of productive offspring

Observations on the number of productive seedlings and plant variety characteristics are presented in appendices 6a to 6b. The independent influence of cultivar on the number of productive plant offspring and the results of the Duncan's multiple distance test (UJDB) are presented in Table 5.6.

Table 6. Independent Influence of Cultivar on The Number of Productive Tillers of Upland Rice Plants (Saplings)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	9	9.67	9	10.33	**9.50 b**	2=1,22
Pae uba	7.67	9	10.5	9.83	**9.25 b**	3=1,28
Pae bou	10.83	11.5	11.67	11	**11.25 a**	4=1,32
Pae bandoeha	8.5	10.83	9.5	9.67	**9.63 b**	
Rerata	**9**	**10.25**	**10.17**	**10.21**	**9.91**	

Note: Numbers followed by letters that are not the same in the same column (a-b) are significantly different at UJBD 0.05

Table 5.6 shows that the pae Bou cultivar (V3) gave the best results in terms of the average number of productive tillers which was significantly different from the pae dai Ngalaru cultivar (V1), the Uba pae cultivar (V2) and the Bandoeha pae cultivar (V4).

This is thought to be one of the adaptations of upland rice to suboptimal and optimal water conditions, because each plant cultivar has the ability to produce different tillers based on its genetic potential. Matsuo and Hoshikawa (1993), argue that those classified as drought-resistant upland rice genotypes will have a low number of tillers with a low rate of decline, the decrease in the number of tillers is in line with the decrease in soil moisture.

6. Flowering Age

Observations on flowering age and plant variety characteristics are presented in appendices 7a to 7b. The independent influence of water conditions and local cultivars on the flowering age of plants as well as the results of the Duncan's multiple distance test (UJDB) are presented in Table 5.7.

Table 7. Independent Influence of Cultivar and Water Conditions on Flowering Age of Upland Rice Plants (Days)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	84.67	80.33	77.33	78	**80.08 d**	2=0,85
Pae uba	101.33	101.33	98.33	91	**98.00 a**	3=0,90
Pae bou	85.33	85.33	84.33	82.67	**84.42 c**	4=0,93
Pae bandoeha	91.67	90	87.33	87.67	**89.17 b**	
Rerata	**90.75 a**	**89.25 b**	**86.83 c**	**84.83 d**	**87.92**	

Note: Numbers followed by letters that are not the same in the same column (a-b) are significantly different at UJBD 0.05

Table 5.7 shows that 25% water conditions (W1) provide the longest results for the average flowering age of upland rice cultivars which is significantly different from 50% water conditions (W2), 100% water conditions (W3) and 150% water conditions (W4).). The 50% water condition (W2) is significantly different from the 100% water condition (W3) and the 150% water condition (W4) and the 100% water condition (W3) is significantly different from the 150% water condition (W4). The Uba pae cultivar (V2) gave the longest results in terms of average flowering age which was significantly different from the Ngalaru pae dai cultivar (V1), the Bou pae cultivar (V3) and the Bandoeha pae cultivar (V4). The Bandoeha pae cultivar (V4) was significantly different from the Bou pae cultivar (V3) and the Ngalaru pae dai cultivar (V1).

Observations of the Ngalaru cultivar showed that it flowered more quickly and the Pae Uba cultivar (V2) flowered the longest under suboptimal conditions compared to cultivars tested in the field. The Ngalaru pae dai cultivar (V1) produced flowers more quickly under optimal water conditions which was not significantly different from the Bandoeha and Bou pae cultivars. This shows that each cultivar has a different flowering age based on its ability to utilize enviro

7. Age of harvest

Observations on harvest age and plant variety characteristics are presented in appendices 8a to 8b. The independent influence of water conditions and local cultivars on plant harvest age as well as the results of the Duncan's multiple distance test (UJDB) are presented in Table 8

Table 8. Independent Influence of Cultivar and Water Conditions on Harvest Age of Upland Rice Plants (Days)Nmental Resources and Its Genetic Potential.

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngala	121,00	114,67	110,00	110,00	113.92 c	2=2,618
Pae uba	125,00	125,00	123,67	122,33	124,00 a	3=2,751
Pae bou	119,67	119,67	122,33	117,00	119.67 b	4=2,838
Pae band	125,00	119,67	119,67	117,00	120.34 b	
Rerata	122.67 a	119.75 b	118.92 bc	116.58 c		

Note: Numbers followed by letters that are not the same in the same column (a-b) are significantly different at UJBD 0.05

Table 8 shows that 25% water conditions (W1) provide the longest results for the average harvest age of upland rice cultivars which is significantly different from 50% water conditions (W2), 100% water conditions (W3) and 150% water conditions (W4).). The 50% water condition (W2) is not significantly different from the 100% water condition (W3) but is significantly different from the 150% water condition (W4) and the 100% water condition (W3) is not significantly different from the 150% water condition (W4). The pae uba cultivar (V2) gave the longest results with respect to the average harvest age which was significantly different from the pae dai ngalaru cultivar (V1), pae bou cultivar (V3) and pae bandoeha cultivar (V4). The pae bandoeha cultivar (V4) and the pae bou cultivar (V3) were not significantly different but were significantly different from the pae dai ngalaru cultivar (V1).

This shows that the cultivars tested in conditions of water shortage experienced stunted vegetative growth so that the plants needed a longer time to reach flowering, resulting in delayed harvest time. When observing the Ngalaru cultivar, the Bou pae cultivar and the Bandoeha pae cultivar showed that it produced flowers more quickly and the Uba pae cultivar (V2) flowered the longest under suboptimal conditions. This shows that each cultivar has a different harvest age based on its ability to utilize environmental resources and its genetic potential.

8. Weight of 1000 Items

Observations on the weight of 1000 grains and plant variety characteristics are presented in appendices 8a to 8b. The independent influence of local cultivars on the weight of 1000 plant grains and the results of the Duncan's multiple distance test (UJDB) are presented in Table 5.8.

Table 9. Independent Influence of Cultivar on The Weight Of 1000 Grains of Upland Rice Plants (G)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	24.8	24.43	25	25.4	**24.91 b**	2=1,12
Pae uba	23.43	21.93	23.4	24.27	**23.26 c**	3=1,17
Pae bou	16.6	17.17	15.77	16.13	**16.42 d**	4=1,21
Pae bandoeha	28.93	29.13	30.27	29.87	**29.55 a**	
Rerata	**23.44**	**23.17**	**23.61**	**23.92**	**23.53**	

Note: Numbers followed by letters that are not the same in the same column (a-b) are significantly different at UJBD 0.05

Table 9 shows that the Bandoeha pae cultivar (V4) gave the best results regarding the average grain weight of 1000 grains which was significantly different from the Dai ngalaru pae cultivar (V1), Uba pae cultivar (V2) and Bou pae cultivar (V3). The Ngalaru pae dai cultivar (V1) was significantly different from the Uba pae cultivar (V2) and the Bou pae cultivar (V3) and the Uba pae cultivar (V2) was significantly different from the Bou pae cultivar (V3).

This shows that each cultivar has different morphological characters, the Bandoeha pae cultivar has large and long seeds compared to the Bou pae cultivar whose seeds are very small but has a better seed weight per panicle and cluster than the Bandoeha pae cultivar.

9. Grain Filled with Permalai

Observations of the grain contents of the plantations and characteristics of plant varieties are presented in appendices 9a to 9b. The independent influence of local cultivars on the grain content of plant perennials and the results of the Duncan's multiple distance test (UJDB) are presented in Table 5.9

Table 10. Independent Influence of Cultivars on The Grain Content of Upland Rice Plants (Seeds)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	115.25	114.93	103.05	94.39	**106.90 b**	2=15,71
Pae uba	101.33	122.6	125.1	112.29	**115.33 b**	3=16,51
Pae bou	148.29	134.31	150.5	130.08	**140.79 a**	4=17,03
Pae bandoeha	86.87	70.02	95.25	87.2	**84.83 c**	
Rerata	**112.94**	**110.46**	**118.47**	**105.99**	**111.97**	

Note: Numbers followed by letters that are not the same in the same column (a-b) are significantly different at UJBD 0.05

Table 10 shows that the pae Bou cultivar (V3) gave the best results for the average grain content of permalai which was significantly different from the pae dai Ngalaru cultivar (V1), the Uba pae cultivar (V2) and the Bandoeha pae cultivar (V4). The Uba pae cultivar (V2) was significantly different from the Ngalaru pae dai cultivar (V1) and the Bandoeha pae cultivar (V4) and the Ngalaru dai pae cultivar (V1) was significantly different from the Bandoeha pae cultivar (V4). The independent differences showed that the best cultivar gave the highest yield in each water condition so that there was no interaction between the cultivar and water conditions on permalai filled grain.

10. Empty Grain Permalai

Observations of empty permalai grain and plant variety characteristics are presented in appendices 10a to 10b. The effect of the interaction of water conditions and local cultivars on the empty grain of perennial plants as well as the results of the Duncan's multiple distance test (UJDB) are presented in Table 11

Table 11. Effect of the Interaction of Water Conditions and Cultivar on The Empty Grain of Upland Rice Plants (Seeds)

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	23.076 c	27.771 a	19.353 a	14.520 a	21.18	2=7.240
	pq	p	p	q		3=7.547
Pae uba	42.233 b	31.711 a	19.300 a	15.575 a	27.205	4=7.754
	p	q	r	r		
Pae bou	49.533 a	18.620 b	18.172 a	11.688 b	24.503	
	p	q	q	q		
Pae bandoeha	18.733 c	31.333 a	6.349 b	9.116 a	16.383	
	q	p	r	r		
Rerata	33.394	27.359	15.794	12.725	22.318	

Note: Numbers followed by letters that are not the same in the same column (a-b) and the same row (p-q) are significantly different at UJBD 0.05

Table 11 shows that 25% water conditions and the Pae Bou cultivar (W1V3) gave the highest yields on average permalai empty grain which was significantly different from 25% water conditions and the Pae Dai Ngalaru cultivar (W1V1), 25% water conditions and the Uba Pae cultivar. (W1V2), 25% water conditions and Bandoeha pae cultivar (W1V4), 50% water conditions and Bou pae cultivar (W2V3), 100% water conditions and Bou pae cultivar (W3V3) and 150% water conditions and Bou pae cultivar (W4V3). Interactions in treatments showed that the pae Bou cultivar which had very high empty grains at 25% water conditions (W1V3) experienced a significant decrease in empty grains when at 50%, 100% and 150% water conditions.

11. Grain Filled Clumps

Observations of grain contents in groves and plant variety characteristics are presented in appendices 11a to 11b. The independent influence of water conditions on the grain content of plant clumps and the results of the Duncan's multiple distance test (UJDB) are presented in Table 5.11.

Table 12. Independent Influence of Water Conditions on Grain Content in Rice Clumps

Perlakuan	25%	50%	100%	150%	Rerata	UJBD
Pae ngalaru	46.8	51.58	52.55	48.65	49.89	2=3,44
Pae uba	43.3	45.88	52.55	50.61	48.08	3=3,62
Pae bou	47.8	51.6	52.77	47.61	49.95	4=3,73
Pae bandoeha	45.27	50.82	51.11	47.28	48.62	
Rerata	45.79 c	49.97 ab	52.25 a	48.54 bc		

Note: Numbers followed by letters that are not the same in the same column (a-b) are significantly different at UJBD 0.05

Table 12 shows that the 100% water condition (W3) gave the best results for the average grain content in the clump on the various upland rice cultivars tested, significantly different from the 25% water condition (W1) and the 150% water condition (W4) but not significantly different. with 50% water conditions (W2). The 50% water condition (W2) is significantly different from the 25% water condition (W1) but is not significantly different from the 150% water condition

(W4) and the 150% water condition (W4) is not significantly different from the 25% water condition (W1). The independent effect shows that 100% and 50% water conditions provide high grain yields in clumps for all cultivars tested so that there is no interaction between water conditions and local upland rice cultivars.

The results of research on clump-filled grain showed that 100% water conditions had the highest clump-filled grain and the lowest in 25% water conditions. The grain in the clump is an illustration of the size of crop production. Plants that have high grain content in clumps will produce large production. The height of the grain in the clump is in line with the results of observations on plant height and number of tillers which had the highest values in 100% water conditions. Plants with optimal vegetative growth will produce optimal production because vegetative growth is the initial process of accumulating energy for seed formation. The formation of seeds or grains in rice plants is largely determined by the availability of water and the plant's ability to absorb solar energy and nutrients in the soil.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Based on the results of the research carried out, it can be concluded that,

1. 100% water volume and the Ngalaru pae dai cultivar have a very real interaction effect on plant height, 100% water conditions and the Bou pae cultivar have a real effect on the number of tillers, 50% water volume and the Uba pae cultivar have a better effect on the number of leaves , and water conditions of 25% and the pae Bou cultivar gave the highest empty grain per panicle.
2. In general, water volume treatments of 50%, 100% and 150% have a better influence on the growth and production of local upland rice.
3. The local upland rice cultivar Pae Dai Ngalaru showed a better growth response and production in terms of plant height, flowering age, number of tillers, shoot dry weight, root dry weight, grain contents per hill, and thousand grain weight.

Recommendations

Based on the research results, it can be suggested that, in cultivating local upland rice, it is recommended that optimal water provision in the dry season has a greater influence on the growth and production of local upland rice, and the Ngalaru pae dai cultivar provides a better growth and production response.

ADVANCED RESEARCH

It is necessary to continue conducting research on Deference Varieties of Local Rice in South east Sulawesi.

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