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**THE GROWTH AND YIELD OF UPLAND RICE (*Oryza sativa* L.) WHICH APPLIED BY RICE HUSK ZEOLITE AND K FERTILIZER**

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**ABSTRACT**

The productivity of upland rice on sub-optimal land such as Podzolic is low. Increasing rice productivity can be attempted, for example through the application of rice husk zeolite and K fertilizer. This research aims to study the interaction of rice husk zeolite with K fertilizer on the growth and yield of upland rice (*Oryza sativa* L.) on Podzolic medium. The research was conducted at the laboratory of Soil and Greenhouse Laboratory, Faculty of Agriculture, Universitas Riau from June to October 2022. The research was conducted experimentally in a factorial form using a completely randomized design (CRD). The first factor was rice husk zeolite consisting of 3 levels (0, 200 and 400 kg.ha-1) and the second factor was K fertilizer consisting of 3 levels (0, 50 and 100 kg.K2O.ha-1), each interaction repeated three times. The results showed that the interaction of rice husk zeolite at a dose of 200 kg.ha-1 with K fertilizer at a dose of 50 kg K2O.ha-1 increased the number of healthy grain per panicle by 21%, the proportion of healthy grain by 14% and the weight of dry milled grain by 32.25% compared to without rice husk zeolite and K fertilizer.

**Keywords**: K fertilizer, podzolic soils, rice husk zeolite, upland rice

**ABSTRAK**

Produktivitas padi gogo pada lahan sub optimal seperti Podsolik rendah. Peningkatan produktivitas padi dapat diusahakan misalnya melalui aplikasi zeolit sekam padi dan pupuk K. Penelitian ini bertujuan untuk mempelajari interaksi aplikasi zeolite sekam padi dengan pupuk K terhadap pertumbuhan dan hasil padi gogo (*Oryza sativa* L.) pada medium Podsolik. Penelitian dilakukan di Laboratorium Ilmu Tanah dan Rumah Kaca Fakultas Pertanian, Universitas Riau dari Juni hingga Oktober 2022. Penelitian dilakukan secara eksperimen dalam bentuk faktorial menggunakan rancangan acak lengkap (RAL). Faktor pertama adalah zeolit sekam padi yang terdiri dari 3 taraf (0, 200 dan 400 kg.ha-1) dan faktor kedua adalah pupuk K terdiri dari 3 taraf (0, 50 dan 100 kg.K2O.ha-1), masing-masing interaksi diulang tiga kali. Hasil penelitian menunjukkan interaksi zeolit sekam padi dosis 200 kg.ha-1 dengan pupuk K dosis 50 kg K2O.ha-1 meningkatkan jumlah gabah bernas per malai 21%, persentase gabah bernas 14% dan berat gabah kering giling 32,25% dibandingkan tanpa zeolit sekam padi dan pupuk K.

**Kata kunci**: Pupuk K, tanah podsolik, zeolit sekam padi, padi gogo

**INTRODUCTION**

Approximately 90% of Indonesia's population consumes rice as a staple food. The need for rice is increasing along with the increase in population from year to year. Therefore there is a need for a solution to increase rice production, one effort that can be done is to plant upland rice on dry land.

The potential and widely available dry land is the Podzolic type. Podzolic land area in Indonesia is around 25% of the total land area of Indonesia or 45 million ha (Prasetyo and Suriadikarta, 2006). Podzolic is classified as sub-optimal land, namely land with very low natural productivity. The low productivity is due to various constraints, including acid sensory soil, low organic matter content, cation exchange capacity (CEC), base saturation (KB), low availability of N, P, K, Ca and Mg nutrients, very low Al solubility. high so that P fixation is high (Fitriatin et al., 2014). Various efforts have been made to increase the productivity of food crops on dry land including upland rice, including finding superior upland rice varieties and seeking technological innovations and the right dosage of fertilizers. The inpago 12 variety, one of the superior upland rice varieties, according to researchers or breeders, has a production of 6.7 tonnes.ha-1 and a yield potential of 10.2 tonnes.ha-1 (BBPP, 2017).

One of the technological innovations to overcome the complex constraints on Podzolic soils is the application of synthetic zeolite, for example rice husk zeolite, namely zeolite synthesized from rice husks. The advantage of zeolite is that it has a high CEC. Katsuki and Komarneni (2009) reported a CEC value of rice husk zeolite of 506 cmol.kg-1.

The high CEC of zeolite can increase the soil's ability to absorb water and nutrients. If the cations adsorbed on the zeolite adsorption site are cations or anions with a valence of 2 or more, a second layer with a positive charge will appear, so that they can adsorb anions or air. If the anion adsorbed on the second layer is charged -2 or more it will create a third layer which is negatively charged so that it can adsorb cations or air, and so on. According to Hardjowigeno (2010) colloidal particles are generally negatively charged, therefore positively charged ions or cations are attracted to the colloid so that an ionic double layer is formed. Therefore, the ability of rice husk zeolite to absorb nutrients and water is very large because it has a very high CEC so that nutrients are not lost due to leaching and are available to plants during the growth phase. Johan et al. (2017) reported that the administration of coal fly ash zeolite increased the growth and yield of rice and reduced the levels of the heavy metal Cd in rice by 0.4 mg.kg-1. Putri (2022) reported that giving coal fly ash zeolite at a dose of 100 kg.ha-1 and catfish POC at a dose of 400 ml per clump increased the weight of dry milled grain of upland rice by 68% compared without zeolite and POC.

Associated with the low potassium in Podzolic, it requires the addition of potassium fertilizer. Potassium is a primary macronutrient which is required in large quantities. The main role of potassium in plants is as a cofactor for most enzymes, potassium also plays a role in the translocation and metabolism of carbohydrates (Wiraatmaja, 2016). Potassium plays a role in strengthening plant organs, accelerating the process of flowering and fruiting, increasing plant resistance to pests and diseases and drought. The availability of potassium in the soil greatly influences physiological and metabolic processes so that it affects crop yields (Annisa and Gustia, 2017). Based on these problems, a study was conducted with the title "Growth and Yield of Upland Rice (Oryza sativa L.) Application of Rice Husk Zeolite and K Fertilizer".

**MATERIALS AND METHODS**

The research was carried out at the Soil and Greenhouse Science Laboratory, Faculty of Agriculture, University of Riau, from June to October 2022.

The materials used were upland rice seeds of the Inpago 12 variety, topsoil of Podzolic taken in Balam Jaya Village, Tambang District, Kampar Regency, Riau, the rice husk zeolite used had a CEC value of 142.87 cmol.kg-1, Urea fertilizer, SP-36, KCl as a source of N, P and K, air, polybags, Confidor 5 WP insecticide, Antracol 70 WP fungicide, Stage 18 EC insecticide, Al(OH)3 and NaOH as a chemical for synthetic rice husk zeolite.

The tools used are oven, furnace, porcelain cup, SAA, hot plate, 25 mesh size soil sifter, flamephotometer, pH meter, analytical balance and spectrophotometer.

The study was conducted experimentally in factorial form using a completely randomized design (CRD). The first factor was rice husk zeolite consisting of 3 levels (0, 200 and 400 kg.ha-1). Factor II K fertilizer (0, 50 and 100 kg K2O.ha-1), each treatment was repeated 3 times.

**RESULTS AND DISCUSSION**

**Initial Podzolic Soil Chemistry**

Table 1 shows that the Podzolic soil (Ultisol) used in the study reacted acidly with a pH of H2O of 4.72. The C/N and Ca-dd ratios are classified as very low. The content of C-organic, Mg-dd, KB and CEC of soil is low. The N-Total, K-dd and Na-dd soils were moderate, but the soil Al saturation was high, while the P-Bray 1, P2O5 (25% HCl) and K2O (25% HCl) content was very high. Antoro and Nelvia (2018) reported that Ultisol Batu Belah, Kampar, Riau has an acid reaction with low fertility, Ca-dd values are very low and C-organic, CEC, Mg-dd values are low, except for aluminum saturation which is very high. Zulputra et al. (2014), reported that Ultisol Pematang Berangan, Rambah, Rokan Hulu, Riau reacted sourly with a low fertility rate. The CEC of the rice husk zeolite used was very high, namely 142.87 cmol(+).kg-1.

**Growth of Upland Rice**

**The Plant Height, Maximum Number of Tillers and Productive Tillers**

Table 2 shows that the interaction of rice husk zeolite with K fertilizer at each dose combination had no significant effect on plant height, maximum number of tillers and productive tillers of upland rice plants compared to no treatment, as well as the main effect of rice husk zeolite or K fertilizer compared to no zeolite rice husk or without K fertilizer for each parameter.

Zeolite has a very high ability to absorb water and nutrients because it has a very high CEC value and has multiple adsorption sites. The CEC value of the rice husk zeolite used was 142.87 cmol.kg-1. The application of synthetic zeolite and increasing the dose only plays a role in increasing the ability of the soil to absorb nutrients and water, not contributing to supplying nutrients because it does not contain nutrients, so its effect does not affect these parameters.

Every metabolic process in plants is an enzymatic process, namely a process that involves enzymes (catalysts), K acts as a cofactor for most of the enzymes in plants through metabolic processes. The main function of potassium is as an enzyme cofactor (Uliyah et al, 2017), plays a role in the translocation and metabolism of carbohydrates (Wiraatmaja, 2016). therefore increasing the dose of K has no significant effect on this parameter.

Rahman et al. (2019) reported that the application of KCl fertilizer with various doses including 200, 250, 300 and 350 kg K2O.ha-1 showed different results but did not significantly increase the height of cabbage plants. Irianto et al. (2020) reported the same thing, where the height of the okra plants was not significantly different by administering several doses of KCl fertilizer, namely 2.5; 5.0; 7.5 and 10 g per plant. The administration of KCl doses did not significantly affect the parameters of the number of branches on the sweet potato where the doses applied were 150, 300 and 450 kg.ha-1 (Hakim et al., 2019). Then Manik (2020) also reported that giving potassium fertilizer at a dose of 12.5; 45 and 67.5 g per plot had no significant effect on the number of tillers in shallot plants.

**Yield of Upland Rice**

**The Age of Out Panicles and Age of Harvest**

Table 3 shows that the interaction of rice husk zeolite dose of 200 kg.ha-1 with K fertilizer dose of 50 kg K2O.ha-1 accelerated panicle exit and harvest compared to no treatment or with other treatments except with interaction of rice husk zeolite dose of 400 kg.ha-1 and K fertilizer dose of 50 kg K2O.ha-1 and rice husk zeolite dose of 200 kg.ha-1 and K fertilizer dose of 100 kg K2O.ha-1 (for panicle budding age only).

Table 3shows that the main treatment of rice husk zeolite at a dose of 200 kg.ha-1 accelerated panicle exit and harvest compared to without rice husk zeolite except by giving rice husk zeolite at a dose of 400 kg.ha-1. The main treatment with K fertilizer dose of 50 kg K2O.ha-1 accelerated panicle exit and harvest compared to no K fertilizer or with K fertilizer dose of 100 kg K2O.ha-1. This is closely related to the function of zeolites which absorb nutrients in the soil, so that nutrients are available to plants and utilized during the phases of panicle formation and fruit ripening. Potassium in this case acts as an enzyme cofactor, thus spurring metabolic processes that support panicle formation and grain filling (forming panicle, flower and grain tissue). Potassium acts as an enzyme cofactor in the metabolism of flowering, fertilization, panicle growth thereby accelerating grain ripening. According to Annisa and Gustia (2017) the functions of K fertilizer include accelerating the rate or process of flowering and fertilization.

Table 3 shows that the application of K fertilizer at a dose of 100 kg K2O.ha-1 slowed the age of panicle exit and harvest when compared to the application of K fertilizer at a dose of 50 kg K2O.ha-1, this resulted in competition between one-valent cations, namely K+ and NH4+ in occupying root adsorption sites, when K is added to plants in large quantities, results in disruption of N uptake, whereas whatever K is absorbed by plants does not affect plant tissue formation if plant tissue-forming elements are not available.

The application of zeolite dose of 200 kg.ha-1 and potassium fertilizer dose of 50 kg K2O.ha-1 is sufficient for the needs of plants so that the plants are utilized optimally. Available K in the soil that was given rice husk zeolite at a dose of 200 kg.ha-1 was classified as high, namely 0.87 cmol.kg-1. Irianto et al. (2020) reported that applying potassium fertilizer can accelerate the flowering of okra plants with the best dose of 10 g per plant.

**Number of filled grains per panicle**

Table 4 shows that the interaction of giving rice husk zeolite at a dose of 200 kg.ha-1 with K fertilizer at a dose of 50 kg K2O.ha-1 increased the number of rice grains per panicle compared to without giving rice husk zeolite and without K fertilizer by 21%.

The role of zeolite is only to absorb nutrients, not as a nutrient contributor as previously explained. Putri (2022) reported that the administration of synthetic zeolite at various doses showed no significant effect on the number of rice grains per panicle of upland rice plants when compared to no zeolite administration. Zeolite can store the availability of nutrients so that it is fulfilled in the grain filling process. The nutrient content is deep enough the process of photosynthesis produces more and more photosynthates resulting in an increasing number of rice grain (Habibullah, 2015). Giving the right dose of fertilizer can increase plant growth due to the efficiency of fertilization which is used optimally according to plant needs. According to Hartati and Purnomo (2018), potassium can increase the allocation of assimilates from the leaves to the grain, thereby increasing the weight of the filled grain in the plant. According to Wachid and Mintono (2017), the formation of the number of rice grains depends on the results of the photosynthesis process that occurs during the grain filling phase during the growth period.

**Percentage of filled grains**

Table 5 shows that the interaction of rice husk zeolite doses of 0, 200 and 400 kg.ha-1 with K fertilizer doses of 0, 50 and 100 kg K2O.ha-1, respectively, was not significantly different, as were the main factors of rice husk zeolite and fertilizer. K to the proportion of rich grain, but in the interaction of giving rice husk zeolite dose of 200 kg.ha-1 and K fertilizer dose of 50 kg K2O.ha-1 increased the proportion of rice husk of upland rice plants by 14% when compared without giving rice husk zeolite with fertilizer K.

This increase is closely related to the role of zeolite in absorbing water and nutrients so as to ensure the availability of air and nutrients to the generative phase which can improve physiological and metabolic processes. Rosalinda and Nirwanto (2021) reported that translocation and accumulation of photosynthate products in the stems and leaves greatly determine the level of grain filling, in which the more photosynthate results, the more grain will be filled.

Potassium in this case plays a role in carbohydrate translocation and carbohydrate metabolism such as the formation of starch, protein, fat and others as a component of grain but does not directly affect the amount of carbohydrates (photosynthate) produced. Potassium is an element needed by plants in the formation of starch and the translocation of photosynthetic products such as sugar (Pranico, 2022).

Chen et al. (2017) reported that the application of zeolite could significantly reduce the percentage of empty grain in the second planting period. Putri's research (2022) reported that giving zeolite fly ash at a dose of 100 kg.ha-1 showed an increase in the percentage of rice grain by 11.89%.

**The Weight of 1000 Filled Grains**

Table 6 shows that the interaction of giving rice husk zeolite doses of 0,200 and 400 kg.ha-1 and K fertilizer doses of 0, 50 and 100 kg K2O.ha-1 as well as the main effect of the two was not significantly different on the weight of 1000 rice grain grains. The weight of 1000 grains indicates the quality of the grain (grain size) which is determined by the number of components making up the grain, namely the amount of photosynthate produced.

Potassium is functional, so the function of potassium in increasing the weight of 1000 grains depends on the amount of photosynthate produced. If the elements needed in photosynthesis are not fulfilled, then giving large amounts of potassium will also not affect the process of photosynthesis.

Ismuhadi (2020) reported that giving KCl fertilizer doses of 100, 200 and 300 kg.ha-1 had no significant effect on increasing the weight of 1000 sorghum seeds aged 15 WAP. Sirait (2017) reported giving rice husk ash at a dose of 2.5; 5.0 and 7.5 tons.ha-1 showed no significant difference to the weight of 1000 grains of grain.

**The Weight of Milled Dry Grains per Clump**

Table 7 shows that the interaction of giving rice husk zeolite doses of 0, 200 and 400 kg.ha-1 with K fertilizer doses of 0, 50 and 100 kg K2O.ha-1 respectively was not significantly different as well as the main effect of rice husk zeolite and fertilizer K on the weight of dry milled grain per clump, but in the interaction of giving rice husk zeolite at a dose of 200 kg.ha-1 and K fertilizer at a dose of 50 kg K2O.ha-1 tends to increase the weight of dry milled grain per clump of upland rice plants by 32.25% when compared without rice husk zeolite and K fertilizer. The results when converted to hectares with a population of 160,000 clusters.ha-1 (planting distance of 25 cm x 25 cm) are 7,8 tons.ha-1. These results exceed the average yield according to breeders, which is equal to 6,7 ton.ha-1.

This increase is closely related to the role of zeolite, in which the provision of nutrients can increase available nutrients because they are absorbed by the zeolite and utilized in the photosynthesis process (producing photosynthate), so that during the generative phase, the results of the photosynthate produced can be utilized with the help of the role of K which plays a role in translocation, carbohydrate metabolism and as an enzyme cofactor (Wiraatmaja, 2016). Photosynthate produced in the process of photosynthesis will be translocated to grain and metabolized in the grain into grain components (starch, protein, fat, etc.), in which potassium acts as an enzyme cofactor (activator of most enzymes). Wijaya's research (2023) showed an increase in the weight of dry milled grain per clump treated with zeolite fly ash 100-300 kg.ha-1 of around 82,59% - 106,19% compared to no zeolite. Putri's research (2020) showed an increase in the weight of dry milled grain per clump by 31,93% compared to without zeolite administration.

**CONCLUSIONS**

1. The interaction of rice husk zeolite at a dose of 200 kg.ha-1 and K fertilizer at a dose of 50 kg K2O.ha-1 tends to increase the number of green grain per panicle by 21%, the percentage of brown rice grain by 14% and the weight of dry milled grain by 32,25% compared without rice husk zeolite and K fertilizer.
2. 2. The main treatment of K2O.ha-1 with a dose of 50 kg K2O.ha-1 accelerated the aging of the panicles and harvest of upland rice plants when compared without K fertilizer or with the treatment of K fertilizer with a dose of 100 kg K2O.ha-1.
3. 3. The primary treatment of rice husk zeolite at a dose of 200 kg.ha-1 accelerated the aging of panicle exit and harvest of upland rice plants when compared to without rice husk zeolite.

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**TABLES, FIGURES AND ILUSTRATIONS**

Table 1. Characteristics and Initial soil chemical properties and rice husk zeolite used for research

|  |  |  |  |
| --- | --- | --- | --- |
| Parameters (Unit) | Unit | Value | Level\* |
| pH | H2O | 4,72 | Acid |
| pH | KCl | 3,88 | - |
| Organic carbon | % | 1,59 | Low |
| Total-N | % | 0,34 | Medium |
| C/N ratio | - | 4,68 | Very Low |
| Available P2O5 (Bray 1) | Ppm | 31,92 | Very high |
| Total P2O5 (HCl 25%) | mg.100g-1 | 63,44 | Very high |
| KB | % | 31,72 | Low |
| CEC | cmol(+).kg-1 | 10,15 | Low |
| Al-dd | cmol(+).kg-1 | 2,96 | - |
| H-dd | cmol(+).kg-1 | 4,48 | - |
| Saturation Al | % | 27,77 | High |
| CEC rice husk zeolite | cmol(+).kg-1 | 142,87 | Very high | |

Note = \* Based on the criteria of soil characteristics proposed by Soil Research Institute (2009)

Table 2. The Plant Height, Maximum Number of Tillers and Productive Tillers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| The Plant Height | | | | |
| Rice husk zeolite dose  (kg.ha-1) | K Fertilizer dose (kg K2O.ha-1) | | | Average |
| 0 | 50 | 100 |
|  | ……cm…… | | |  |
| 0 | 115,20 a | 120,63 a | 116,17 a | 117,33 a |
| 200 | 112,20 a | 122,67 a | 122,47 a | 119,11 a |
| 400 | 117,47 a | 120,03 a | 116,43 a | 117,97 a |
| Average | 114,95 a | 121,11 a | 118,35 a |  |
| The Maximum Number of Tillers | | | | |
| ……tillers….. | | | | |
| 0 | 17,00 a | 16,00 a | 14,00 a | 15,67 a |
| 200 | 16,00 a | 18,67 a | 16,00 a | 16,89 a |
| 400 | 15,00 a | 17,33 a | 16,33 a | 16,22 a |
| Average | 16,00 a | 17,33 a | 15,44 a |  |
| The Productive Tillers | | | | |
| ……tillers….. | | | | |
| 0 | 16,67 a | 14,67 a | 13,67 a | 15,00 a |
| 200 | 14,00 a | 17,00 a | 15,33 a | 15,44 a |
| 400 | 14,67 a | 15,00 a | 14,67 a | 14,78 a |
| Average | 15,11 a | 15,56 a | 14,56 a |  |

Note: Numbers in the same row and column followed by the same lowercase letters are not significantly different according to the DNMRT test at the 5% level.

Table 3. The maximum number of tillers and productive tillers of upland rice plants aged 56 HST treated with rice husk zeolite and K fertilizer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rice husk zeolite dose  (kg.ha-1) | K Fertilizer dose (kg K2O.ha-1) | | |  |
| Average |
|  | 0 | 50 | 100 |  |
| The maximum number of tiller | | | | |
| ……tillers….. | | | | |
| 0 | 70,00 ab | 69,33 ab | 71,67 a | 70,33 a |
| 200 | 69,33 ab | 65,33 c | 68,00 abc | 67,55 b |
| 400 | 70,00 ab | 67,00 bc | 69,67 ab | 68,89 ab |
| Average | 69,77 a | 67,22 b | 69,78 a |  |
| The productive number of tiller | | | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | ……tillers….. | | | | | | 0 | 95,33 a | 93,33 ab | 96,67 a | 95,11 a | | 200 | 94,67 ab | 88,33 c | 93,00 ab | 92,00 b | | 400 | 95,33 a | 90,67 bc | 94,67 ab | 93,56 ab | | Average | 95,11 a | 90,77 b | 94,78 a |  | | | | | |

Note: Numbers in the same row and column followed by the same lowercase letters are not significantly different according to the DNMRT test at the 5% level.

Table 4. Number of filled grain per panicle in upland rice treated with rice husk zeolite and K fertilizer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rice husk zeolite dose  (kg.ha-1) | K Fertilizer dose (kg K2O.ha-1) | | |  |
| Average |
|  | 0 | 50 | 100 |  |
| Number of filled grain per panicle | | | | |
| ……grain….. | | | | |
| 0 | 147,34 ab | 141,62 ab | 132,92 b | 140,63 a |
| 200 | 145,57 ab | 179,27 a | 149,40 ab | 158,08 a |
| 400 | 160,60 ab | 152,59 ab | 137,77 b | 150,32 a |
| Average | 151,17 a | 157,82 a | 140,03 a |  |

Note: Numbers in the same row and column followed by the same lowercase letters are not significantly different according to the DNMRT test at the 5% level.

Table 5. The percentage of filled grain of upland rice was treated with rice husk zeolite and K fertilizer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rice husk zeolite dose  (kg.ha-1) | K Fertilizer dose (kg K2O.ha-1) | | |  |
| Average |
|  | 0 | 50 | 100 |  |
| ……%….. | | | | |
| 0 | 76,96 a | 76,22 a | 80,05 a | 77,74 a |
| 200 | 82,16 a | 88,07 a | 80,20 a | 83,47 a |
| 400 | 85,98 a | 87,45 a | 79,07 a | 84,16 a |
| Average | 81,70 a | 83,91 a | 79,77 a |  |

Note: Numbers in the same row and column followed by the same lowercase letters are not significantly different according to the DNMRT test at the 5% level.

Table 6. The weight of 1000 filled grains of upland rice was treated with rice husk zeolite and K fertilizer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rice husk zeolite dose  (kg.ha-1) | K Fertilizer dose (kg K2O.ha-1) | | |  |
| Average |
|  | 0 | 50 | 100 |  |
| ……g….. | | | | |
| 0 | 21,51 a | 21,79 a | 22,03 a | 21,77 a |
| 200 | 22,13 a | 22,02 a | 22,33 a | 22,16 a |
| 400 | 22,04 a | 23,19 a | 22,18 a | 22,47 a |
| Average | 21,89 a | 22,33 a | 22,18 a |  |

Note: Numbers in the same row and column followed by the same lowercase letters are not significantly different according to the DNMRT test at the 5% level.

Table 7. The Weight of milled dry grain per clump of upland rice plants treated with rice husk zeolite and P fertilizer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rice husk zeolite dose  (kg.ha-1) | K Fertilizer dose (kg K2O.ha-1) | | |  |
| Average |
|  | 0 | 50 | 100 |  |
| ……g….. | | | | |
| 0 | 37,08 a | 45,09 a | 34,43 a | 43,06 a |
| 200 | 45,71 a | 49,04 a | 43,72 a | 41,96 a |
| 400 | 43,94 a | 48,59 a | 40,81 a | 44,44 a |
| Average | 42,24 a | 47,57 a | 39,65 a |  |

Note: Numbers in the same row and column followed by the same lowercase letters are not significantly different according to the DNMRT test at the 5% level.