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Uptake of Nitrogen, Phosphorus, and Potassium Nutrients in Various Local rice varieties with various irrigations

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A B S T R A C T

Intermittent irrigation in cultivating rice plants can reduce and save water needs. The study aims to identify NPK nutrient uptake in various kinds of irrigation to select the suitability of local rice varieties in several types of irrigation. The research was conducted in the Experimental Land, Soil, and Plant Nutrition Laboratory and Production Laboratory of the Faculty of Agriculture, University of Muhammadiyah Yogyakarta, for five months. The research method was conducted using a field experiment with a Randomized Complete Block Design (RCBD) of 3 repetitions and a 3 by 4 strip plot layout. Factor I, namely irrigation, includes conventional irrigation (A1), ten days of inundation and five days of drying (A2), and seven days of inundation and three days of drying (A3). Factor II is the rice varieties, including Rojolele Genjah (V1), Pandan Wangi (V2), Mentik Wangi (V3), and Ciherang (V4). The results showed no interaction between the irrigation type and the variety of the observed parameters. Irrigation does not affect the absorption of N, P, and K, but it affects the weight of rice clump grain. Variety influences the uptake of P and K in rice plants. The Pandan Wangi variety has a higher P absorption than other varieties. Rojolele varieties have higher K absorption than Pandan Wangi and Ciherang varieties. The grain weight per rice clump of the Pandan Wangi variety is heavier than that of other varieties. Grain weight per rice clump with 10-day intermittent irrigation: 5-day drying is heavier than conventional irrigation. It is necessary to develop rice cultivation of the Pandan Wangi variety with intermittent irrigation because it does not reduce the absorption of N, P, and K, and the grain per clump is heavier

Contribution to Sustainable Development Goals (SDGs):
SDG 2: Zero Hunger
SDG 6: Clean Water and Sanitation
SDG 12: Responsible Consumption and Production

1. INTRODUCTION

1.1. *Research Background*

Irrigation water is intended to support land productivity and increase agricultural production. System of Rice Intensification (SRI) is a rice cultivation technique that can increase rice productivity by changing the management of plants, soil, water, and nutrients. Nutrients in the soil can be reduced. Things that can reduce nutrients in the soil are because they are washed with drainage water, evaporate, and are absorbed by plants. The presence of primary macronutrients in the soil dramatically affects rice growth.

For this reason, this study discusses the absorption of primary macronutrients in various rice varieties carried out in different types of irrigation. Sewage sludge enhanced soil Cd availability and rice grain Cd uptake, but pig or chicken manure reduced rice grain Cd content. Nutrients such as nitrogen (N), phosphorus (P), and potassium (K) are the primary macronutrients that rice plants need for their growth. Nitrogen helps arrange proteins, nucleic acids, and chlorophyll in plants to make plants greener and accelerate plant growth, such as plant height, number of saplings, and number of branches. Phosphorus (P) helps spur root growth, forming a robust root system, promoting flower formation, and facilitating fruit and seed ripening. Research is needed on the nutritional and sensory characteristics of oyster mushroom catfish meatballs containing carrageenan.

1.2. Literature Review

Millions of rural communities rely on rice (Oryza sativa L.), the world's most significant staple food crop, for their livelihood [1]. Since rice accounts for over 42% of all food grain output and is a staple food for over two-thirds of the Indian population, sustainable rice production is strongly related to food security in India. However, declining groundwater levels, deteriorating water quality, and growing demands from other sectors make it increasingly difficult to find enough water for rice production [2]. Some water-saving technologies (WST) have been implemented, including shallow intermittent irrigation (SII), controlled irrigation (CI), and alternate wet and dry (AWD). [3].

Many nations use the System of Rice Intensification (SRI) based on changes to rice cultivation management techniques. However, there is considerable debate about it. [4]. The percentage of white-colored (functional) roots is significantly higher when SRI techniques are used, such as mechanical weeders that aerate the topsoil and alternate wetting-and-drying irrigation that makes the soil periodically aerobic. [5]. The field was flooded following transplanting, with a flood water depth of 3–5 cm maintained until the tillering stage. The water was drained at the maximum tillering stage to minimize unproductive tillers. Additionally, wetting–drying alternation irrigation was carried out during the grain filling duration, and water was drained a week before maturity [6].

Phosphate fertilizer application showed no discernible impact on the Cd level of rice grains. Continuous application of high-content organic or phosphate fertilizers may cause soil Cd accumulation and impact rice crop Cd [9]. Traditional transplanted rice farming uses a lot of labor, energy, and irrigation water [1]. The indigenous supply of these nutrients from soil, organic matter, and irrigation water—as well as nutrient removal with grain and straw—forms the basis of fertilizer P and K recommendations [10]. Irrigated rice depends solely on irrigation during the dry season and is mainly grown with additional irrigation during the rainy season [11].

Ref. [12] indicated that integrating AWD with management techniques can lower the overall amount of water used while raising rice yield. Increased rice root activity and element bioavailability during alternate wetting and drying (AWD) irrigation has been shown to improve heavy metal (HM) absorption, which leads to HM ending up in rice grains [13]. Well-known high-yielding cultivars need a steady supply of synthetic pesticides and fertilizers. Therefore, creating high-yielding cultivars suited to low-input circumstances is essential to the success of these LI systems [14]. With a predicted value of 3.099 for the partial regression coefficient (beta coefficient), using superior seeds is the variable that most affect lowland rice production in Martapura Sub-District, East Ogan Komering Ulu Regency [7]. When measures such as the percentage of germination (88.18%), plant height (28.78 cm), and root length (20,74 cm) on day 15 after planting were measured, the results indicated that the use of 2.5% fish waste fertilizer generated the best results [15].

It has been demonstrated that using high-yielding rice cultivars that are fertilizer-responsive and resistant to significant disease pests, along with better irrigation and cultivation practices, increases productivity, production efficiency, and food sufficiency [7]. When combined with additional irrigation and better nitrogen management, enhanced root growth in rice can work in concert to boost grain output and resource efficiency in rainfed rice [8]. As an enzyme activator, potassium (K) helps absorb water and nutrients from the soil and transport assimilated products from leaves to plant tissues [16]. According to Wakid [17], this irrigation system can increase rice productivity by 50% and even, in some places, reach 80%. This method can maintain soil fertility by utilizing soil microorganisms to provide essential plant nutrients. Through this irrigation system, soil fertility is well restored by utilizing soil microorganisms as a metabolite provider for plant nutrients [18].

1.3. Research Objective

The study aims to identify NPK nutrient uptake in various kinds of irrigation to select the suitability of local rice varieties in several types of irrigation

2. MATERIALS AND METHODS

2.1. Research Design

The research was carried out in the Experimental Land, Soil and Plant Nutrition Laboratory, Production Laboratory, Faculty of Agriculture, University of Muhammadiyah Yogyakarta, and UNS Soil Laboratory using experimental research conducted with a 4x3 strip plot factorial research design which was arranged in a Complete Group Random Design with three replicates so that 36 research units were obtained. Factor I consists of 3 levels, namely A1 (irrigation with continuous or conventional inundation), A2 (irrigation after 10 days of inundation and 5 days of draining), A3 (irrigation after 7 days of inundation and 3 days of draining). Factor II is listed from 4 varieties, namely V1 (Rojolele Genjah), V2 (Pandan Wangi), V3 (Mentik Wangi), V4 (Ciherang). The parameters observed were soil analysis before and after planting, plant tissue analysis, nutrient uptake N, P, and K, plants' dry weight, grain weight per clump, and cation exchange capacity.

2.2. Methodology

2.2.1. Statistical analysis

Data analysis was performed utilizing Test F at a significance level of 5%. Following this, further tests were executed using the Duncan Multiple Range Test at a significance level of 5% to evaluate the different treatments.

3. RESULT AND DISCUSSION

3.1. Soil Analysis Before Planting

Soil analysis before planting is carried out to determine soil fertility level before being treated. The parameters used in the soil analysis before planting include nutrients N, P, and K, actual soil pH, organic matter, and Cationic Exchange Capacity (KPK). The soils analyzed included regosol soils. According to Nurhalimah et al. [19], this soil type has a high sand content and a low fertility

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level but can be managed and used for agricultural activities. The results of soil analysis before planting are presented in Table 1.

Table 1. Results of soil analysis before planting

Analysis	Average	Unit	Information
N total	0,187	%	Low
P available	8,697	Ppm	Low
K available	0,183	me%	Low
Actual soil pH	6,6	-	Neutral
Organic matter	1,44	%	Very Low
Cation Exchange Capaci	17,92	cmol/kg	Keep

Description: Criteria for assessing the results of soil analysis according to IAARD [20]

According to Ref. [21], organic matter in the soil can increase microbes and nutrient turnover. In addition, organic matter in the soil can also loosen the soil surface layer, increase soil compactness, and improve water absorption and storage capacity to be stable. Organic matter can play a role in increasing soil Cation Exchange Capacity (CEC) and modifying water retention. Ref. [22] stated that low organic matter in the soil causes low soil fertility. Organic matter is one of the materials that can improve the structure of sandy soil into soil that clumps and binds water. Low organic matter in the soil causes low KPK, so the existing nutrients can be washed out.

3.2. *Analysis of N, P, K Plant Tissue*

3.2.1. N Levels of Plant Tissue

Based on the N graph of plant tissue (Figure 1), Pandan Wangi rice has a relatively higher N content of plant tissue, followed by the rice varieties Rojolele Genjah and Mentik Wangi. Based on Figure 1b, irrigation is irrigated for 7 days and drained for 3 days, showing that the N of plant tissue is relatively higher than conventional irrigation. Through the intermittent irrigation method, the land is inundated and then drained. This condition causes plant roots to exchange oxygen gas in the root area and grow better, supporting growth. The N content of plant tissues is affected by the absorption process. In addition, the application of Urea fertilizer can also affect the N content of plant tissues [23].

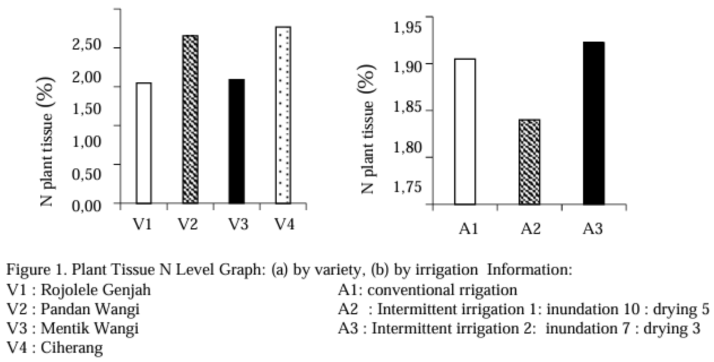

Figure 1. Plant Tissue N Levels Graph: (a) by variety, (b) by irrigation

3.2.2. P Levels of Plant Tissue

The graph of P levels in plant tissue (Figure 2a) shows that the Pandan Wangi variety has a relatively high P level in tissue compared to other local varieties, namely the Rojolele Genjah and Mentik Wangi varieties. However, the Pandan Wangi variety showed that the P of plant tissue was relatively high as that of the Ciherang variety. Intermittent irrigation of SRI 7 days inundated and 3 days drained showed that the P of plant tissue was relatively higher compared to the varieties Rojolele Genjah and Mentik Wangi. The number of productive saplings produced affects the total P level of tissue because phosphorus helps the emergence of panicles in rice plants during the generative period. The more productive saplings produced, the more panicles produced, and the higher the total tissue P level

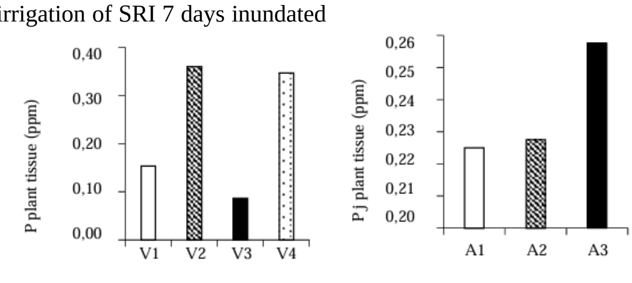

Figure 2. Plant Tissue P Level Graph: (a) by variety, (b) by irrigation

Information:

V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang

A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.2.3. Plant Tissue K Levels,

Based on the K level of plant tissue (Figure 3a), the rice variety Rojolele Genjah showed that the yield of plant tissue K levels was relatively higher than that of the Pandan Wangi and Mentik Wangi varieties. Intermittent irrigation of SRI 7 days inundated 3 days drained has a relatively higher K level of plant tissue compared to the Mentik Wangi variety, followed by the Pandan Wangi variety. According to Ref. [24], potassium is found in the soil in large quantities, but only a few are used by plants. The potassium used by the plant is water-soluble or interchangeable potassium (in soil colloids). The exchange of adsorbent cations with cations freely present in groundwater can be carried out by colloidal clay and humus. Organic matter in the soil can also help bind K so that it is not washed out and can be released slowly, which the plant absorbs.

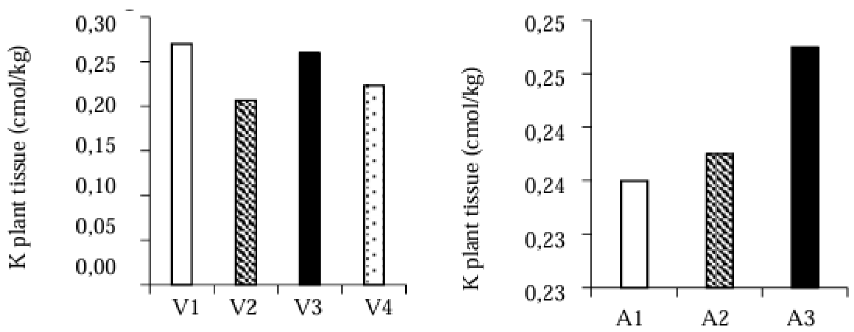

Figure 3. Graph of Plant Tissue K Levels, (a) by variety, (b) by irrigation

Information:
V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang
A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.3. N, P, and K Uptake in Plants

3.3.1. Absorption of N in plant tissues

Based on the results of the variety fingerprints in Table 2, there is no interaction between irrigation and rice varieties. No interaction shows that irrigation and rice varieties do not affect each other on the absorption of N in plant tissue. The type of irrigation did not show any real difference, nor did the varieties tested show any real difference. This difference suggests that different gene factors still have the same response in the uptake of N in plant tissues. In this case, the difference in gene factors has the same effect on N uptake in plant tissues.

According to Ref. [25], the growth and development of the number of saplings in rice plants is influenced by the availability of N in the soil. Ref. [26] also stated that genetic factors influence the number of saplings rice plants produce—the amount of nitrogen absorbed by plants. Thus, genetic factors will always affect the growth and development of rice plants. One of the factors that supports plants in growing is the availability of nutrients in the soil. The addition of fertilizer results the amount of nutrients in the soil. These nutrients can help the rapid growth of rice plants and can increase production [27].

Table 2. Average Absorption of N Plant Tissue (grams/plant)

Treatment	V1	V2	V3	V4	Average
A1	0.8570	1.2783	0.6923	1.1293	0.9425 a
A2	0.8153	1.0223	0.6220	1.0470	0.8198 a
A3	1.1010	1.0917	0.8257	0.9447	1.0061 a
Average	0.9244 p	1.1307 p	0.7133 p	1.0403 p	(-)

Remarks: Numbers followed by the same letter in a row or column showed no difference based on DMRT at the level of α = 5 %.
(-) = There is no interaction between irrigation and varieties
V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang
A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.3.2. Plant tissue uptake P

Based on the analysis of the variance of P absorption by plant tissues, irrigation, and varieties have no interaction. This interaction shows that irrigation and varieties do not affect each other in plants when absorbing plant P elements. P uptake of plant tissues showed no significant difference between irrigations. However, there is a real difference in P uptake in plant tissues in various varieties. This difference shows that this variety affects the absorption of P in plant tissues. Table 3 shows

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that the P absorption of Pandan Wangi and Ciherang rice varieties is higher than that of Rojolele Genjah rice and Mentik Wangi rice. Local rice varieties have genetic traits resistant to biotic stress, such as pests and diseases or abiotic stress in weather and environmental conditions. With this difference in genetic characteristics, rice will grow according to its ability to adapt to the environment. According to Sisworo [28], applying P fertilizer can increase the availability of P in soil. Tisdale et al. [29] also stated that applying P fertilizer into the soil can increase the concentration of P in the soil.

Table 3. Plant tissue uptake P (g/plant)

Treatment	V1	V2	V3	V4	Average
A1	0.086	0.179	0.040	0.166	0.118 a
A2	0.081	0.160	0.030	0.173	0.111 a
A3	0.106	0.228	0.046	0.140	0.130 a
Average	0.091 q	0.189 p	0.039 r	0.159 p	(-)

Remarks: Numbers followed by the same letter in a row or column showed no difference based on DMRT at the level of α = 5 %.
(-) = tidak ada interaksi antar pengairan dengan varietas
V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang
A1: conventional rrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.3.3. Absorption of K in plant tissues

Based on the results of the K absorption of plant tissue (Table 4), there was no interaction between irrigation and variety. This interaction shows that irrigation and varieties do not affect each other's K absorption of plant tissues. Irrigation also does not show a real difference between conventional irrigation, 10 days after SRI is flooded, 5 days drained, and SRI is flooded 7 days after 3 days drained. Likewise, the variety showed K absorption, which did not show a noticeable difference between varieties. There is a mineralization process during the inundation process, and after that, the plant absorbs the element K. In addition, the KCl fertilizer also adds K content to the plant's roots, which will later increase the K absorbed by the plant. According to Subandi [30] and Taufiq., et al. [31], K is mobile and relatively easy to lose through erosion and leaching processes.

Table 4. Average Nutrient Uptake K of Plant Tissue (grams/plant)

Treatment	V1	V2	V3	V4	Average
A1	6.098	4.155	4.530	4.194	4.744 a
A2	5.266	4.227	3.744	4.360	4.399 a
A3	7.548	4.237	5.436	3.486	5.176 a
Average	6.304 p	4.206 p	4.57 p	4.013 p	(-)

Remarks: Numbers followed by the same letter in a row or column showed no difference based on DMRT at the level of α = 5 %.
(-) = no interaction between irrigation and varieties
V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang
A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.4. Dry Weight of Plants

Based on the results of the dry weight of plants (Table 5), there is no interaction between irrigation and varieties. The lack of interaction shows that irrigation and varieties have no real effect on the dry weight of plants. Between conventional irrigation treatments, there was no real difference between 10 days of SRI inundation and 5 days of drained irrigation, and 7 days of SRI inundation and 3 days of drainage. The lack no difference shows that the irrigation used does not affect the dry weight of rice plants. Rice varieties also do not affect the dry weight of rice plants.

The morphology and physiology of the plants significantly improved when the rice crop was cultivated using modified SRI techniques under rainfed conditions [4]. According to BBPADI [32], genes in rice plants affect the growth of a plant, resulting in unequal plant growth. Rice with a drooping leaf position can do photosynthesis better because it gets more sunlight and converts it into photosynthetics stored in the plant part. Characteristics like this can add to the dry weight of the plant.

Table 5. Average Dry Weight of Plants (grams)

Treatment	V1	V2	V3	V4	Average
A1	57.91	56.07	44.67	48.88	158.65 a
A2	54.01	47.12	38.40	50.82	179.13 a
A3	66.74	54.32	51.62	38.87	172.68 a
Average	178.66 p	157.51 p	134.69 p	138.57 p	(-)

Remarks: Numbers followed by the same letter in a row or column showed no difference based on DMRT at the level of α = 5 %.
(-) = There is no interaction between irrigation and varieties
V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang
A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.5. *Dry Weight of Grain Per Clump*

Based on the results of the variation in grain dry weight per clump (Table 6), there was no interaction between irrigation and varieties. The lack of interaction shows that irrigation and varieties do not affect each other in terms of the dry weight of grain per clump. Rice plant varieties show fundamental differences between varieties. Likewise, irrigation shows actual results between irrigations.

Based on the average dry weight of grain per clump in Table 6, the Pandan Wangi variety is heavier than Ciherang and Mentik Wangi. The Mentik Wangi variety is heavier than the Rojolele variety. According to Karim and Endang [33], rice plants have genetic potential, namely the highest yield, which limits the ability of a rice variety to produce grain. Thus, one variety with another can give different results according to the variety and environment, affecting the photosynthetic yield in the form of dry grain weight per clump.

SRI intermittent irrigation systems provide a higher grain dry weight per clump than conventional irrigation (Table 6). Inefficiency in water use carried out by continuous inundation can cause an increase in nutrient loss that affects rice yield [34]. Excess water can cause a decrease in nutrients in the soil, which plants will later absorb and convert into photosynthesis in the form of grain.

Table 6. Average dry weight of grain per clump (grams)

Treatment	V1	V2	V3	V4	Average
A1	13.70	43.39	22.42	27.08	26.65b
A2	28.63	50.87	31.70	36.40	36.45a
A3	17.52	35.03	36.98	32.37	30.48ab
Average	19.95 r	43.10 p	30.37 q	31.35 q	(-)

Remarks: Numbers followed by the same letter in a row or column showed no difference based on DMRT at the level of α = 5 %.
(-) = There is no interaction between irrigation and varieties
V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang
A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.6. *Soil Analysis After Harvest*

3.6.1. *Total N levels*

Based on the analysis graph of soil N after harvest (Figure 4), it is known that the soil N content after harvest in conventional irrigation shows relatively high yields between the rice varieties Mentik Wangi and Rojolele Genjah, followed by the Pandan Wangi and Ciherang varieties. The varieties Rojolele Genjah and Mentik Wangi showed a relatively higher yield of soil N after harvest than the Ciherang variety.

SRI 7-day intermittent irrigation inundated 3 days, drained, and conventional, showing N Total soil after harvest is relatively higher than SRI 10-day intermittent irrigation inundated 5 days, drained. Soil after traditional irrigation treatment tends to contain higher BO than intermittent irrigation. The mineralization of organic matter contributes nitrogen to the soil. The higher the organic matter, the higher the nitrogen, the higher the nitrogen [35].

3.6.2. *Total P levels*

Based on the P analysis graph after harvest (Figure 5), in irrigation with SRI 10 days of inundation and 5 days of drying, it shows that the yield of the Mentik Wangi variety has a relatively high P yield after harvest followed by the Pandan Wangi and Rojolele Genjah varieties. It is suspected that soil with SRI intermittent irrigation can bind water and nutrients in the soil by aggregates. With the binding of these nutrients, the soil P level after harvest can increase, which is not easy to leach and can be absorbed by plants.

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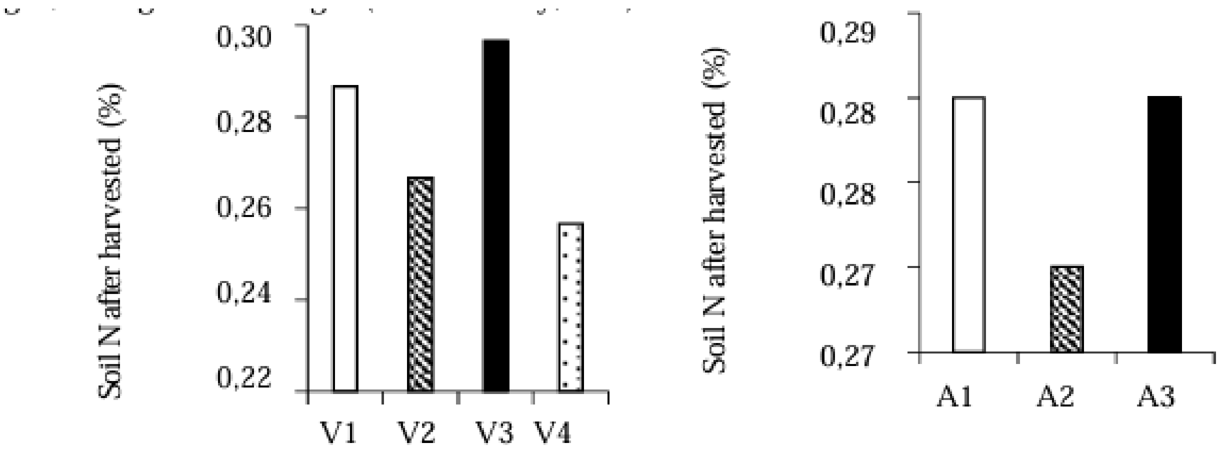

Figure 4. Graph N Soil After Harvest, (a) based on variety, (b) based on irrigation

Notes:

V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang

A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

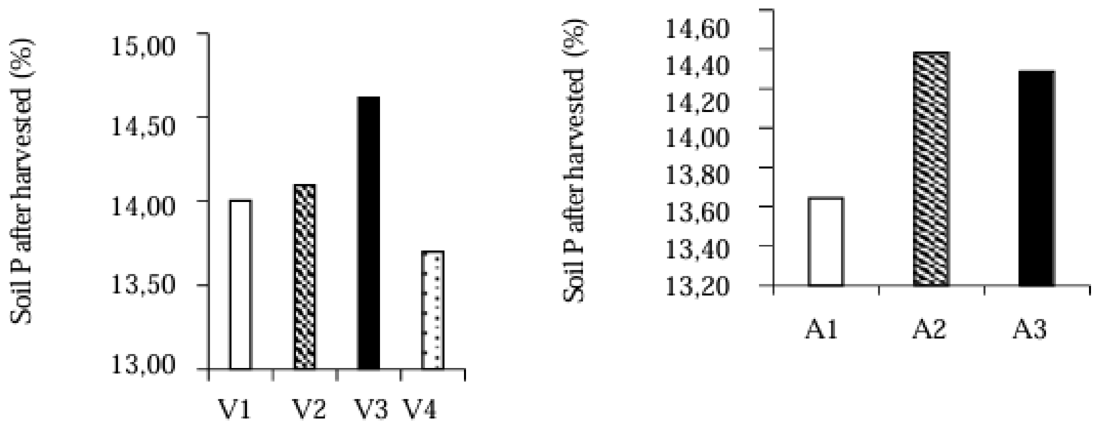

Figure 5. P Graph of Soil After Harvest, (a) by variety, (b) by irrigation

Notes:

V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang

A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

3.6.3. K Level: Available levels

Based on the K graph of the soil after harvest (Figure 6), Mentik Wangi rice showed a K yield after harvest, which was relatively high compared to the Rojolele Genjah variety, followed by the Pandan Wangi variety. In SRI irrigation, 7 days after being flooded for 3 days dried, Mentik Wangi gave a K yield after a relatively high harvest, followed by the Rojolele Genjah and Pandan Wangi varieties. The process of destroying minerals is assisted by water to release elements K and other components. With K bound by organic matter, K is not washed away

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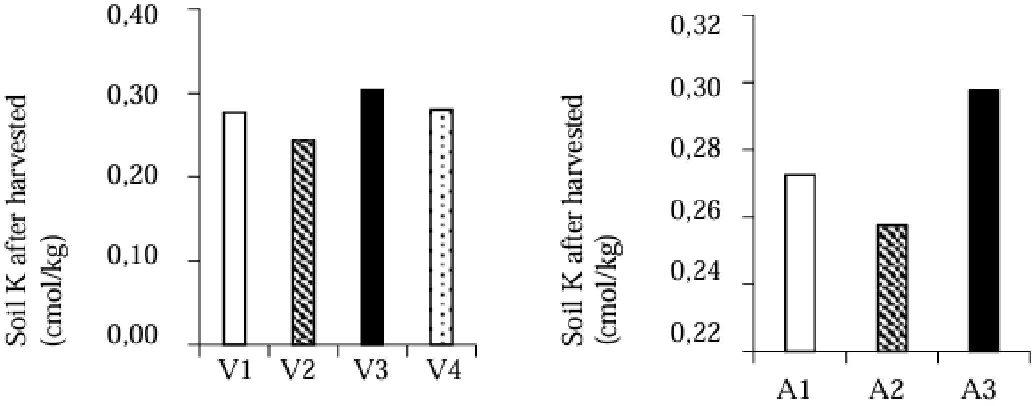

Figure 6. K Graph of Soil After Harvest, (a) by variety, (b) by irrigation

3.7. Cation Exchange Capacity (CEC)

Cation Exchange Capacity (CEC is one of the chemical properties of soil that is closely related to the availability of plant nutrients. This KPK is an indicator of soil fertility. The higher the organic content in the soil, the higher the KPK. The Cation Exchange Capacity in each soil varies. Soil with a high sand content has a lower CEC than soil with clay or dust content.

The CEC of the soil depends on the type and amount of clay content, organic matter, and pH of the soil. The cation exchange capacity of the soil that has a lot of charge depends on the pH. Cations are positively charged ions. In the soil, these cations are dissolved in water or can be trapped by soil colloids. Local rice varieties show that the yield of soil KPK after harvest in all irrigations is relatively higher than that of Ciherang varieties.

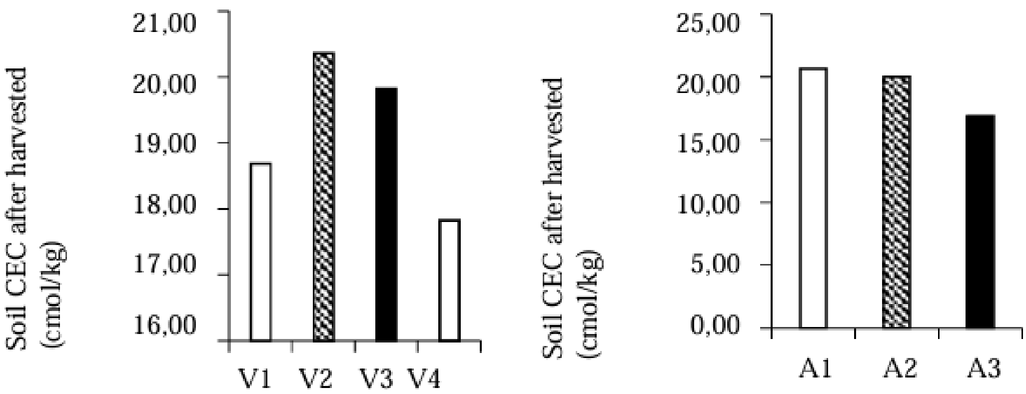

Figure 7. Cation Exchange Capacity (KPK) Chart After Harvest, (a) by variety, (b) by irrigation

Notes:

V1 : Rojolele Genjah
V2 : Pandan Wangi
V3 : Mentik Wangi
V4 : Ciherang

A1: conventional irrigation
A2 : Intermittent irrigation 1: inundation 10 : drying 5
A3 : Intermittent irrigation 2: inundation 7 : drying 3

4. CONCLUSION

There was no interaction between irrigation types and local rice varieties regarding nutrient uptake of N, P, and K in plant tissues. The absorption of N, P, and K of total plant tissue between intermittent irrigation was 10:3, 7:3, and intermittent irrigation was not different. Varieties affect the absorption of total P in plant tissues. The Pandan Wangi and Ciherang rice varieties provide higher P absorption than Rojolele Genjah rice. And Scented Tick. The rice variety Rojolele Genjah provides higher P absorption than Mentik Wangi rice. Conducting a study on the effects of greenhouse gases caused by conventional and intermittent irrigation (SRI) is necessary.

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