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Assessment of Three Heirloom Rice Landraces in Rainfed Areas of Abra in Philippines

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ABSTRACT

Heirloom rice demand in the Philippines and international market is high due to its outstanding eating quality, texture, taste, aroma, and nutritional value, thus, the study was conducted to assess the performance of three heirloom rice landraces, namely, ballatinaw, oliog, and talakdang. A Randomized Complete Block Design consisting of 45 plots each block with an area of 10 square meters per plot was used for a total of 180 plots covering a total of 2,438 square meters. Statistical Tool for Agricultural Research was used to analyze the gathered data, and Least Significant Differences were used to compare the significant differences between and among treatment means. Based on the result, Oliog significantly outperformed Ballatinaw and Talakdang in terms of initial and final height, panicle length, number of leaves, and the length of the flag leaf. Ballatinaw produced the highest number of tillers and productive tillers, while the Talakdang produced the widest flag leaf, the highest number of panicle grains, the most number of filled grains, and the lowest number of unfilled grains and sterility percentage. However, Ballatinaw produced the highest yield and was observed to be more suited to the rainfed areas than Talakdang and Oliog, which could be attributed to the genetic traits of Ballatinaw. The study was conducted to determine the most suitable and appropriate variety of heirloom rice for production in the rainfed areas in the province of Abra, Philippines.

RESUMO

A demanda por arroz crioulo nas Filipinas e no mercado internacional é alta devido à sua excelente qualidade de consumo, textura, sabor, aroma e valor nutricional. Assim, este estudo foi conduzido para avaliar o desempenho de três variedades crioulas de arroz crioulo: Ballatinaw, Oliog e Talakdang. Utilizou-se um delineamento experimental em blocos casualizados, com 45 parcelas por bloco e área de 10 metros quadrados, totalizando 180 parcelas, cobrindo uma área total de 2.438 metros quadrados. O programa Statistical Tool for Agricultural Research (STAR) foi utilizado para analisar os dados coletados, e o teste de Diferença Mínima Significativa (LSD) foi empregado para comparar as diferenças significativas entre as médias dos tratamentos. Os resultados mostraram que a variedade Oliog apresentou desempenho significativamente superior às variedades Ballatinaw e Talakdang em termos de altura inicial e final, comprimento da panícula, número de folhas e comprimento da folha bandeira. A variedade Ballatinaw apresentou o maior número de perfilhos e perfilhos produtivos, enquanto a Talakdang apresentou a folha bandeira mais larga, o maior número de grãos na panícula, o maior número de grãos cheios e o menor número de grãos vazios e percentual de esterilidade. No entanto, a Ballatinaw apresentou o maior rendimento e demonstrou ser mais adequada para áreas de sequeiro do que as variedades Talakdang e Oliog, o que pode ser atribuído às características genéticas da Ballatinaw. O estudo foi conduzido para determinar a variedade de arroz crioulo mais adequada e apropriada para o cultivo em áreas de sequeiro na província de Abra, Filipinas.

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Introduction

Rice is the most important staple crop globally, playing a crucial role in food security. Its production depends on several factors, including the quality of planting materials, farming practices, climate conditions, and, most importantly, government intervention and support. In times of production shortages, importation has become the primary solution pursued by the government. However, the quality of imported rice often differs significantly from domestically produced rice. The country boasts a rich diversity of inbred rice varieties cultivated by farmers. Despite the availability of new rice strains, many farmers revert to growing traditional rice due to its superior eating quality and aroma. Indigenous farming communities, in particular, continue to produce these traditional varieties, preserving their agricultural heritage and ensuring that high-quality, flavorful rice remains an integral part of the local food culture.

Rice in Asian countries plays an important role in the economy; it serves as the main staple food for the people (Yuan et al., 2021). To combat food insecurity and the global food crisis, increasing rice production is important (Wuthi-Arporn, n.d.). Rice varieties cultivated by more than 8,000 worldwide differ in quality and nutritional content (Zareiforoush et al., 2016). Most of the agricultural land in the world was cultivated by rice, and corn ranks second (Tumrani et al., 2015). By 1950, the global population is predicted to increase to 10.4 billion from 8 billion this year (Roser, 2019). In more than 100 countries and across six continents, rice is grown in various environments (Rao et al., 2017), and rice production and consumption are among the highest in Asia (Muthayya et al., 2014).

Rice (*Oryza sativa*) is a starchy edible cereal grain in Poaceae family, rice is eaten by 95 percent of people (Tikkanen, 2023). Since the start of civilization, thousands of rice cultivars have been selected for increasing productivity (Hussain et al., 2014). In this generation, the use of inbred rice and hybrid rice for production is the most useful due to their productivity performance. High yield potential for hybrid rice is possible under favorable conditions (Villa et al., 2012), such as proper management, irrigation, fertilization, and other factors considered. Hybrid rice has been documented to produce a 9-20% yield average compared to inbred rice (Xu et al., 2021). Inbred rice is the most common cultivar grown by farmers in the Philippines. NSIC Rc 216, 160, 222, and 300, these varieties are known for their eating quality and low amylose content (PRRI, 2018).

Heirloom rice grains come in stunning colors such as black, brown, purple, pink, and pearly white; they are fragrant with a nutty taste and high in fibers; despite all those characteristics, most heirloom rice only thrives in fragile places (Calumpang et al., 2014). Furthermore, Heirloom rice is cultivated by the ancestors of cordilleras, it is colored glutinous rice with outstanding quality (DA-BAR 2017). The heirloom demand is locally and internationally high in markets, and still, the production is low (PRRI, 2017). Glover (2017) stated that traditional rice cultivars are typically low-yield, aromatic, tall with minimal tillering capacity, and morphologically diverse. However, heirloom rice cultivars are low-yielders and rarely grown commercially (Rogeno et al., 2018).

Ballatinaw is the most common type of heirloom rice cultivated in the Province of Abra. Ballatinaw rice has the highest value of the anthocyanin content of the unpolished rice (Romero, et al., 2017).

Moving on to another heirloom cultivar in Abra, Oliog is one of the most common heirloom cultivars grown by farmers in the upland areas. Oliog produced the highest number of productive tillers compared to Ngarabngab and Intan; however, the yield is lower than those other heirloom varieties (Edwin et al. 2012).

In the neighboring Province of Kalinga, the heirloom rice cultivar Talakdang originates but was later introduced to some farmers in the Province of Abra. Talakdang has a reddish with white spots on the grains when milled. Its eating quality is high and is also known for its aroma, which is common to heirloom rice, especially when cooked.

In the Philippines, production of a high volume of quality rice is one significant role of the government to supply the needed consumption volume for every Filipino. Furthermore, agriculture is the major source of income for Filipinos living in rural areas (SRD, 2021). As such, the government is making ways to address problems in Agriculture in the country to attain food security and self-sufficiency and minimize the importation of rice from other countries. To feed the more than 112 million population of the Philippines, the government included in the Updated Research and Development Agenda of DOST-PCAARRD, 2020-2028, the field verification and adaptability trials of improved varieties, which allows researchers to adapt and test the suitability of different varieties of rice in the country.

The study was conceptualized to determine the most suitable variety of heirloom rice for production in the rainfed areas of the province of Abra. The result is significant for farmers to know the right and appropriate varieties of heirloom rice to produce. Moreover, heirloom rice often possesses unique flavors and nutritional benefits not found in modern hybrid varieties. As global interest in traditional and organic foods grows, ensuring the continued conservation of heirloom rice can support local farmers, boost economic opportunities, and safeguard cultural heritage.

Methods

The study was conducted during the wet season of 2022, spanning from June 29 to December 07, at the Abra State Institute of Sciences and Technology, Main Campus, located in Lagangilang, Abra, Philippines. The research site was a rice field exclusively cultivated during the wet season, relying solely on rainfall for water supply.

Soil collection and analysis

A soil sample for chemical analysis was collected from the experimental area before planting. After collection, the soil samples were air-dried and pulverized. From the samples collected, 1 kg. was sent to the Department of Agriculture Region
two for laboratory analysis.

Procurement of inputs.
Viable seeds of the different varieties of heirloom rice were procured from rice farmers in the province who are known to be growing this variety even before. The Urea fertilizer was purchased from an agricultural Supply located at Lagangilang. At the same time, other materials, such as straw ropes and cable ties, were procured in Bangued, Abra.

Cultural management practices

The following activities were the systematic management practices involved in the study:

Land preparation

Two weeks before transplanting activity, the experimental area was prepared to let the weeds and grasses decompose and to allow drop seeds to germinate. The activities involved were:

Rotavating

The experimental area was rotavated one week before harrowing to allow the decomposition of weeds.

Field leveling. One week after rotavating, the experimental area was leveled once, horizontally and vertically, to pulverize the soil thoroughly and to fix the low and high spots of the experimental area that may cause uneven water distribution.

Seedbed preparation

One week after harrowing, three wet seedbeds measuring 20 square meters each were constructed for sowing the three heirloom rice that will represent the treatments. One-meter distance from each bed was made to avoid mixing.

Field lay-outing.

Lay-outing was immediately done a day after field leveling. Four blocks were prepared *with 45 plots in each block representing the treatments.*

***Soaking* of seeds**

The seeds of different heirloom varieties were placed in a sack at half field capacity, tied, and soaked into the plastic drum filled with water, and water was changed every six hours to avoid spoilage of water that may cause rotting of the seeds.

Incubation of seeds.

After 24 hours of soaking, the rice seeds were taken from the drum and let dry in the corner for at least 10 minutes. The rice seeds were incubated in an area free from danger, and the soaked seeds were covered with green leaves to produce enough heat to make the seeds germinate.

Sowing of seeds.

The pregerminated seeds of the different heirloom cultivars were sown to the assigned beds through broadcasting, one after the other.

Care and management of the seedlings.

The seedlings were regularly visited in the morning and oftentimes in the afternoon to monitor the stand and do necessary things to make it grow healthy and vigorous.

Pulling of seedlings.

Rice seedlings were pulled a day before transplanting; the seedlings were placed in separate areas of the field to avoid mixing.

Transplanting.

In the early morning before transplanting, the seedlings were distributed to their designated plot for transplanting. After all the seedlings were distributed, transplanting followed at a distance of 25x25 cm spacing between hills with three seedlings per hill.

Fertilizer application.

Twenty days after transplanting, 50 grams of urea was evenly broadcasted in all the treatment plots. For the Bureau of Soil Recommendation (B1), a mixture of 50 grams of Ammonium Phosphate (16-20-0) and 26.67 grams of Urea (46-0-0) was applied at planting, and 50 grams of urea were also applied at the booting stage.

Water management.

Water was maintained at 2-3 cm depth one week after transplanting and further increased to 5-7 cm after the seedlings recovered. Water was lessened two weeks before harvesting to provide uniform maturity of the crops. Water levels were checked regularly to avoid the growth of weeds.

Weeding.

The weeds were manually removed from the plots from the time of transplanting up to the booting stage and when weeds were visible in the experimental area. This was done during these stages to avoid the competition for nutrients that the main crop should need.

Pest and disease management.

Regular monitoring was done to check the status of the crops, to identify the insect pest and observe diseases present to what stage, and the level of destruction to the crops. It was observed that after the nearby fields had already harvested their rice, rice bugs were observed in the study, and the application of insecticides was employed to avoid yield loss.

Roguing. One purpose of the study is to provide seeds for establishing heirloom rice seed production in Abra, and roguing is necessary to remove off-type, diseased plants, and other varieties grown in the same plots. Roguing was done during the vegetative stage up to the maturity stage by uprooting the whole plant and then placed in the bunds for decomposition.

Harvest management.

Harvested rice was threshed immediately after harvesting to avoid damage caused by insect pests and other elements contributing to yield degradation. The crop was harvested when 80 percent of its panicle was golden yellow and when the grains on its neck were already complete and yellow in color. Harvesting of most of the treatments is very hard due to strong winds and frequent aftershocks of earthquakes that lead to lodging.

Postharvest management.

The rice was sun-dried until the seeds were hard to crack using the teeth. After threshing, the variety was blown and placed in a labeled transparent plastic bag for drying. After drying, the rice seeds were weighed to know the yield per treatment, and after weighing, it was stored ready for future use.

Research Design

A Randomized Complete Block Design (RCBD) was used in lay-outing the study, four blocks consisting of 45 plots each block with an area of 10 square meters per plot, were used for a total of 180 plots covering a total of 2,438 square meters.

The treatments were as follows:

C1 - Ballatinaw
C2 - Oliog
C3 - Talakdang

Data Gathered

***Initial height* (cm).** Ten (10) sample plants were randomly selected and tagged 14 days after transplanting (DAT) from the different rows of the plot excluding the border rows.

Final height (cm). Ten (10) sample plants were taken from the same sample plants in the initial height gathering. Samples were measured 2 days before harvesting.

Number of tillers per hill. Productive and Non-productive Tillers from 10 randomly selected hills were counted 2 days before harvesting, and the average tiller number per plant was calculated.

Productive Tillers per hill. The productive tillers were determined for each plot 2 days before harvesting.

Panicle length (cm). Ten sample plants from each hill and panicle length were measured 2 days before harvesting.

Number of leaves before flowering. The number of leaves before flowering was taken from the 10 sample plants per hill and the average was obtained.

Flag leaf length (cm). One sample flag leaf from each of the ten sample hills was measured 2 days before harvesting using a meter stick.

Flag leaf width (mm). The sample used for gathering the width is the same as the length of the flag leaf; the width was measured from the most comprehensive section of the flag leaf using a digital caliper, the gathering of the flag leaf was 2 days before harvesting.

Number of grains per panicle. This was gathered from the ten sample hills from each plots.

Filled grains per panicle. Selected from the 10 samples from the grains per panicle.

Unfilled grains per panicle. Unfilled grains were taken from the samples from the number of grains. The unfilled grains are those grains that are empty.

Chlorophyll index. A SPAD meter was used to gather the varieties' chlorophyll index before the extracts were applied, the gathering was done twice a day before the application of foliar extracts. Ten sample leaves were randomly taken from the sample plants in each plot to know the chlorophyll content of the crop.

Grain sterility percentage. The data for the grain sterility percentage was taken from the 10 sample panicles in each plot. The sterility percentage was calculated based on using the formula:

$$\text{(1)} \quad \text{Sterility \%} = \frac{\text{Total number of grains} - \text{number of unfilled grains}}{\text{Total number of grains}} \times 100$$

Weight of 1000 grains (g). One thousand (1, 000) grains at about 14% moisture content were selected from the samples after drying and weighed on the electronic weighing scale.

Straw yield (kg). The fresh rice straws obtained from each plot were weighed and recorded after threshing.

Plot yield. The grain weight (kg) from each plot was converted and recorded. The moisture percentage as at 14% Level after drying.

Yield per hectare. Converted from the plot yield into kilograms per hectare.

$$\text{(2) Yield/ha} = \frac{\text{Plot Yield (kg)}}{\text{Plot size (sq.m.)}} \times 10{,}000 \text{ sq.m.}$$

Data Analysis

Analysis of Variance (ANOVA) was used to statistically analyze the data. Least Significant Differences (LSD) were used to compare the significant differences between and among treatment means using the Statistical Tool for Agricultural Research (STAR) software.

Results and Discussion

Soil chemical analysis

The mean chemical properties of the soil in the experimental area, including pH, organic matter (OM%), phosphorus (P ppm), and potassium (K ppm), are presented in Table 1. Soil analysis results indicate a pH of 7.37, with 2.22% organic matter, 12.8 mg/kg phosphorus, and 93.47 mg/kg potassium.

The recorded soil pH aligns with the findings of Santos et al. (2017), who reported that rice cultivated in paddy soils typically thrives within a pH range of 5.1 to 8.1. These results suggest that the experimental site's soil conditions fall within the optimal range for rice production.

Table 1.
Macronutrient Data in the Experimental Area

Macronutrients			
pH	OM %	P (ppm)	K (ppm)
7.37	2.22	12.8	93.47

The analysis results indicate an abundance of potassium (K), which may be attributed to the consistent application of potassium fertilizer during each rice cropping season. These findings align with the idea presented by Lewu et al. (2020), which suggests that potassium levels in the soil increase through the addition of potassium-rich fertilizers.

Chlorophyll index

Based on Table 2 on the first chlorophyll reading, Talakdang (C3) was observed to have the highest chlorophyll content with 44.32 nm, followed by Ballattinaw (C1) with 41.49, and Oliog (C2) with 33.25 nm, respectively. The table shows the significance of all the means of the three varieties.

Furthermore, chlorophyll content in the second reading of the different heirlooms declined. As such, Talakdang (C3) contains a chlorophyll index of 43.8 nm, Ballatinaw (C1) of 41.06, and lastly, Oliog (C2) with 30.84.

Table 2.
Chlorophyll Index of the Different Heirloom Rice Varieties.

Variety	Chlorophyll Reading 1	Chlorophyll Reading 2
CI – Ballatinaw	41.49^{b}	41.06^{b}
C2 – Oliog	33.25^{c}	30.84^{c}
C3 -Talakdang	44.32^{a}	43.08^{a}

Means with the same letter are significant.

Table 2 shows a consistent result among varieties from the first to the second reading of the chlorophyll content. Talakdang (C3) recorded the highest chlorophyll readings (44.32 and 43.08), indicating that it has the most active photosynthetic potential. This suggests better light absorption, which can contribute to stronger plant development and possibly higher yield. *Ballatinaw (C1)* showed intermediate values (41.49 and 41.06). While slightly lower than Talakdang, its chlorophyll levels are still relatively high, suggesting good photosynthetic efficiency. Oliog (C2) had the lowest readings (33.25 and 30.84), meaning it has less chlorophyll compared to the other varieties. This could indicate lower photosynthetic activity, potentially affecting plant vigor and grain production. Moreover, a significant difference between the treatment means was recorded based on ANOVA. Xu et al. (2011) stated that the chlorophyll content of rice leaves indicates the capacity of rice in photosynthesis. Furthermore, according to Sivaranjani et al. (2020), chlorophyll pigment acts as an essential factor in photosynthesis that is very much needed in crops.

Growth and Growth Components

Table 3 presents the mean initial height, final height, tillers per hill, productive tiller per hill, panicle length, number of leaves before flowering, length of flag leaf, and width of flag leaf of plants of the different heirloom varieties.

Initial Height of the rice plant shows Oliog (C2) was the tallest (62.93 cm), followed by Talakdang (C3) **(**57.46 cm**)** and Ballatinaw (C1) (53.88 cm). This suggests that Oliog had the most vigorous early growth, and the Final Height**,** Oliog remained the tallest (180.2 cm), with Talakdang reaching 142.05 cm, and Ballatinaw the shortest at 113.57 cm**.** This means Oliog has the most significant growth increased, while Ballatinaw had a more compact structure. The height was associated with the agronomic characteristics of the variety.

Table 3.

Growth and Growth Components of the Different Heirloom Varieties.

Variety	Initial Height (cm)*	Final Height (cm)*	Number of Tillers per Hill*	Productive Tillers per Hill*	Panicle Length (cm)*	Number of Leaves before flowering *	Length of Flag Leaf (cm)*	Width of Flag Leaf (mm)*
C1–Ballatinaw	53.88^{c}	113.57^{c}	18.88^{a}	18.28^{a}	22.84^{b}	5.84^{b}	28.71^{b}	10.55c
C2–Oliog	62.93^{a}	180.2^{a}	17.57^{b}	16.62^{b}	27.10^{a}	7.58^{a}	47.97^{a}	10.83b
C3 –Talakdang	57.46^{b}	142.05^{b}	9.33^{c}	8.63^{c}	26.93^{a}	2.77^{c}	29.64^{b}	11.77a

Means with the same letter are significant.

The data on the number of tillers shows that Ballatinaw had the highest number of tillers per hill (18.88), indicating strong vegetative growth. Oliog followed with 17.57 tillers, showing competitive tillering ability. Talakdang produced the fewest tillers (9.33), which might result in lower panicle production. Not all tillers developed into grain-bearing panicles, nevertheless, tillers are not vital as yield determinants (Ranawake et al., 2013). The number of tillers per hill is associated with the application of nitrogenous fertilizer and the abundance of water during the early vegetative stage of the rice plant. As mentioned by Yuan et al. (2024), water can greatly promote rice tillering. Ballatinaw had the highest productive tillers (18.28), meaning almost all its tillers contributed to grain production. Oliog had slightly fewer (16.62). Talakdang had the lowest (8.63), suggesting fewer grain-bearing panicles.

The varieties showed significance in the panicle length of the different varieties (Table 3, Column 6). According to Sadimatara et al., (2018), rice with long panicles potentially produces a higher yield because of the significant relationship between panicle length, the number of panicle grains, and the weight of 1,000 grains.

Analysis of Variance showed significant results on the number of leaves before flowering (Column 7 of Table 3). The number of leaves produced by the Three varieties of heirloom rice showed that Oliog (C2) produced the greatest number of leaves (7.58) and Talakdang (C3) got the least number of leaves (2.77). A comparison of means indicates a non-comparable number of leaves before flowering of the three heirloom varieties.

On the length of the flag leaf Oliog (C2) was recorded to be the tallest among the three varieties (47.97 cm) and the shortest, with a mean length of 28.71cm produced in the Ballatinaw (C1) variety (Table 3, column 8). A comparable length of flag leaf produced by Ballatinaw (C1) and Talakdang (C3) was indicated by employing the Least Significant Difference (LSD). It is known that Photosynthesis happens in the flag leaf and provides the majority of carbohydrates needed for the grain filling of rice plants (Benjamin, 2021).

Analysis of variance showed significant and non-comparable results on the width of the flag leaf (Table 3, column 9). It was observed to be broader in Talakdang (C3) at 11.77 mm, and the Ballatinaw (C1) recorded the narrowest with a mean of 10.55mm. Zhang et al. (2015) stated that the flag leaf width positively correlates with the yield per plant. Furthermore, Bassuony et al. (2020) mentioned that the grain yield in rice is significantly related to the leaf area index.

The yield and yield components gathered on the different varieties of heirloom rice show a significant result of the analysis, meaning all the varieties performed on their own.

Yield and Yield Components

Table 4 shows a significant difference in most parameters used to measure the yield and yield components of the varieties employing the Least Significant Differences (LSD) at a 5% level.

The number of grains per panicle represents the total grains found on a single rice panicle. Among the three varieties studied, Talakdang (C3) exhibited the highest grain count at 204.54, while Ballatinaw (C1) and Oliog (C2) had lower but comparable counts (125.25 and 124.83, respectively). A greater number of grains per panicle often indicates higher yield potential. Several genetic, environmental, and physiological factors influence grain number per panicle. Certain genes regulate panicle architecture, spikelet differentiation, and overall grain development, as highlighted in the findings of Lu et al. (2022).

Filled Grains per Panicle were the grains that fully developed and matured. Talakdang (C3) exhibits the highest number at 171.39, followed by Ballatinaw (C1) (75.55) and Oliog (C2) (62.70). Higher filled grains contribute positively to the final yield. Unfilled Grains per Panicle are grains that did not fully develop. Oliog (C2) has the most unfilled grains (57.34), followed by Ballatinaw (C1) (48.54), while Talakdang (C3) has the least (34.78). A lower number of unfilled grains generally signifies better grain formation. The ability of the rice plant to produce and transport carbohydrates in developing grains are crucial. Poor photosynthesis can lead to lower grain filling, also if the panicles are long, probability is high that lower spikelet will not be filled (Fin, 2012).

Grain Sterility Percentage shows the percentage of grains that did not develop properly. Oliog (C2) has the highest sterility rate (49.03%), followed by Ballatinaw (C1) (39.44%), while Talakdang (C3) has the lowest (16.34%). Lower sterility percentage is desirable for higher productivity.

Weight of 1000 Grains (g) measures the average weight of 1000 grains, indicating grain quality. Ballatinaw (C1) and Talakdang (C3) have similar weights (29.27g and 29.25g, respectively), while Oliog (C2) has a lower weight at 25.98g. The weight of 1000 grains reflect on the ability of the varieties to produce yield. The heavier the weight, the higher the production.

Table 4.

Yield and Yield Components of the Different Heirloom Varieties

Variety	Number of Grains per Panicle*	Filled Grains per Panicle*	Unfilled Grains per Panicle*	Grain Sterility Percentage*	Weight of 1000 Grains (g)*	Straw Yield (kg)	Plot Yield (kg)*	Yield per Hectare* (kg)
C1 – Ballatinaw	125.25[b]	75.55[b]	48.54[b]	39.44[b]	29.27[a]	10.43	4.21[a]	4215[a]
C2 – Oliog	124.83[b]	62.70[c]	57.34[a]	49.03[a]	25.98[b]	10.98	1.47[c]	1472.5[c]
C3 – Talakdang	204.54[a]	171.39[a]	34.78[c]	16.34[c]	29.25[a]	10.38	2.94[b]	2942.5[b]

Means with the same letter are significant.

Based on the mean of straw yield, it was noticed that Oliog (C2) was the highest at 10.98 kg, followed by Ballatinaw (B2) at 10.43 and Talakdang (C3) at 10.38 kg, respectively.

On the yield of the three varieties (Plot and Per hectare), it was recorded that Ballatinaw(C1) has the highest yield per hectare (4215 kg). Talakdang (C3) follows with 2942.5 kg. and Oliog (C2) has the lowest yield (1472.5 kg). Pautin et al. (2015) mentioned in their study that the Ballatinaw yielded 6–6.7 tons per hectare compared to other traditional rice.

Conclusion

Based on the study's findings, Ballatinaw can be identified as the best heirloom rice variety suited for the rainfed areas of Abra. Its production is deemed profitable, given its low production cost, high market value, and promising demand both locally and internationally. These factors highlight Ballatinaw's potential as a valuable variety for sustainable rice farming and economic growth. The production of heirloom rice is more cheaper than growing new varieties of rice as long as the right practices in rice farming is observed.

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