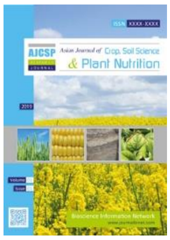
Published with Open Access at Journal BiNET
Vol. 10, Issue 01: 387-394

Asian Journal of Crop, Soil Science and Plant Nutrition

Journal Home: https://www.journalbinet.com/ajcsp-journal.html



Weed management and yield performance of T. *Aman* rice as influenced by *Artocarpus heterophyllus* leaf residues

Fahmida Fiza[1], Mahfuza Begum[1], Md. Liton Mia[1], Biswajit Das[2], Shakil Ahmed[3], Farjana Jannat Shimo[3], Kazi Md. Younus Tanim[4], Prantika Datta[3], Shishir Kanti Talukder[1] and Md. Shafiqul Islam[1]

[1]Department of Agronomy, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
[2]Dept. of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
[3]Department of Soil Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
[4]Department of Agriculture, Noakhali Science and Technology University, Noakhali-3814, Bangladesh

✉ Article correspondence: shishir.nstu@gmail.com (Talukder, SK)
Article received: 24.12.2023; Revised: 05.04.2024; First published online: 30 June, 2024.

ABSTRACT

The emergence of herbicide-resistant weeds and environmental concerns about synthetic pesticides have significantly developed alternative weed management techniques. Allelopathy has the largest yield potential of any weed control strategy and has no adverse environmental effects, making it the best option. To investigate the allelopathic effects of Artocarpus heterophyllus leaf residues on weed management and the yield performance of T. aman rice, the current experiment was set up at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, from July to December 2021. Three rice varieties, BRRI Dhan34, Kalizira, and Nizershail, as well as three residual treatments of A. heterophyllus leaves, 0, 1.0, and 2.0 t ha^{-1}, were used in the field experiment. The grain yields in BRRI Dhan34 were the highest at 5.00 t ha^{-1}, while those in Nizershail were the lowest at 4.13 t ha^{-1}). Applying A. heterophyllus leaf residue at a rate of one t ha^{-1} resulted in the greatest number of effective tillers hill^{-1}, number of grain panicle^{-1}, 1000-grain weight, and grain and straw yield. Applying residue from A. heterophyllus leaves at a rate of one t ha^{-1} resulted in the maximum grain yield (7.06 t ha^{-1}) for BRRI dhan34. Based on study results, A. heterophyllus residue considerably impacts T. aman rice yield and can limit weed growth. The remainder of A. heterophyllus may be utilized to manage weeds efficiently and sustainably while cultivating crops.

Key Words: *Allelopathy; Artocarpus heterophyllus; Weed management; T. Aman rice and Yield.*

Cite Article: Fiza, F., Begum, M., Mia, M. L., Das, B., Ahmed, S., Shimo, F. J., Tanim, K. M. Y., Datta, P., Talukder, S. K. and Islam, M. S. (2024). Weed management and yield performance of T. *Aman* rice as influenced by *Artocarpus heterophyllus* leaf residues. Asian Journal of Crop, Soil Science and Plant Nutrition, 10(01), 387-394. **Crossref:** https://doi.org/10.18801/ajcsp.100124.47

I. Introduction

Bangladesh is among the world's leading producers of rice. For about two billion Asians and 400 million people in Africa and Latin America, rice is a staple diet (IRRI, 2022). After China, India, and

Indonesia in terms of area and production, Bangladesh is the world's third-largest producer of rice (FAO, 2021). Bangladesh's primary food is rice, which has been prioritized above all else to fulfil the needs of the country's rapidly growing population (Paul et al., 2021a; Paul et al., 2021b). Weeds are thought to be the main factor limiting rice yield among the other elements. Without keeping the soil free of weed infestation, it is impossible to get the full benefits of the rice field. Because weeds lower crop yields, raise production costs and degrade quality, they hurt rice producers financially (Bhuler et al., 1998; Ahmed et al., 2014). In addition, unchecked weeds have the potential to ruin rice crops completely (Ahmed et al., 2014). According to Abbas et al. (2021), the yield losses resulting from weed infestation in rice cultivation surpass the sum of yield losses resulting from insects and illnesses. Hand weeding is a difficult and time-consuming traditional method of controlling weeds in Bangladesh. The alternatives to hand weeding are pesticides and mechanical weeding. While hand weeding and herbicides work well together to manage weeds, they are bad for the environment (Ahmed et al., 2005). Combining hand weeding with herbicides could increase agricultural yields, but the production expenses are significant (Prasad and Rafy, 1995; Sathyamoorthy et al., 2004). Researchers are focusing more on employing various agricultural residues to inhibit plant growth and combat weed infestation. Rather than being a waste, crop leftovers are an excellent natural resource. Due to its numerous implications on the physical, chemical, and biological aspects of soil, residue management is gaining much attention. In addition, weeds regulate the amount of nutrients that may be replenished in soils on an annual basis because the leftovers from commonly grown crops are substantial and should be taken into account. Worldwide research is being done on alternative weed management techniques in response to growing concerns about the negative consequences of the careless use of agricultural herbicides on human health and the environment. One such strategy is the use of various crop plant species' allelopathic capability for weed control in agricultural settings (Sabhayamoorthy et al., 2004).

II. Materials and Methods

Experimental site

From July to December of 2021, the current study was conducted at Bangladesh Agricultural University, Mymensingh, at the Agronomy Field Laboratory. The experimental field was situated in the non-calcareous dark grey floodplain soil under the Sonatala series of the Old Brahmaputra Flood plain, which is part of the Agro-ecological region of the Old Brahmaputra Flood plain (AEZ-9) at 24°25´ N latitude and 90°50´ E longitude. It was elevated to an elevation of 18 meters above sea level (FAO and UNDP, 1988).

Experimental treatments and design

There were two components to the experimental treatment. They are listed below: Rice varieties (3): BRRI dhan34 (V_1), Kalizira (V_2), and Nizershail (V_3) comprise Factor A. Factor B: *Artocarpus heterophyllus* leaf residues: 1.0 tha^{-1} (R_2), 2.0 tha^{-1} (R_3), and no crop residues (R_1). Three replications and a randomized complete block design (RCBD) were used to set up the experiment. There were 37 plots in all. Every plot measured 2.5 m by 2.0 m. A designated area of land was chosen to cultivate seedlings.

Land preparation

The area was first levelled using a ladder and then thoroughly ploughed with a country plough. On July 5, 2021, the sprouting seeds were planted in three separate nursery beds. In the nursery bed, the healthy seedlings were raised with the necessary attention. The nursery bed was irrigated when needed and weeds were pulled. On August 19, 2021, the field was made ready. After preparing the area, a tractor-drawn plough was used to plough the field. After cleaning and eliminating any weeds and stubble, the person was laddered. Final plots were created before the field was laid out. The urea, triple super phosphate, and muriate of potash were applied at 240, 100, and 120 kg ha^{-1} to the experimental plots for BRRI Dhan34, Nizershail, and Kalozira, respectively. Before finishing the land preparation, the entire amount of fertilizer aside from urea was applied. Two top dressings of urea were applied at 20 and 40 days following transplantation (DAT). When the last stages of land preparation were completed, the leftover *Artocarpus heterophyllus* leaves were applied seven days before rice transplanting. Afterwards, a shovel was used to mix the remains into the appropriate plots thoroughly. One day, before removing the seedlings, water was sprayed onto the nursery bed. On August 15, 2021, the seedlings were uprooted and moved right away to the main field. For transplanting, seedlings that were healthy and of a comparable size were chosen. On August 19, 2021, seedlings were transplanted at a pace of three seedlings hill^{-1} into a well-prepared puddled field, with row and hill distances of 25 cm and 15 cm, respectively.

Data recording

Data on yield and yield contributing characters were recorded from five randomly selected sample plants from each plot on the following parameters should be done for maximum yield: Plant height (cm), Number of total tillers hill$^{-1,}$ Number of effective tillers hill$^{-1,}$ Number of non-effective tiller hill$^{-1,}$ Panicle length (cm), Number of grains panicle$^{-1,}$ Number of sterile spikelet's panicle$^{-1,}$ 1000- grain weight (g), Grain yield (t ha^{-1}), Straw yield (t ha^{-1}), Biological yield (t ha^{-1}), Harvest index (%). The crops were harvested at full maturity. The maturity of crops was determined when 90% of the grains became golden yellow colour. The harvest of BRRI dhan34, Kalizira, and Nizershail took place on December 5, 2021. Subsequently, every plot's harvested crop was packed individually, appropriately levelled and transported to the threshing floor. Following the harvest, a 1-meter-square section in the centre of each plot was used to weigh the fresh grain and straw. Following a thorough cleaning of the grains, the weight was eventually adjusted to achieve a 14% moisture content. The grain and straw yields were measured and converted to t ha^{-1} after the straw was sun-dried.

Harvest index

The link between grain yield and biological yield is known as the harvest index.

$$\text{Harvest index (\%)} = \frac{\text{Grain yield}}{\text{Biological yield}} \times 100$$

Statistical analysis

Statistical analysis was performed when the data were correctly gathered, tabulated, and processed. With the use of the computer program MSTAT-C, analysis of variance was performed. According to the guidelines provided by Gomez and Gomez (1984), the mean differences between the treatments were determined using Duncan's Multiple Range Test (DMRT).

III. Results and Discussion

Yield and yield contributing characters at harvest

Plant height: There was a noticeable difference in plant height among the varieties. The plants in BRRI Dhan 34 were found to be the highest at 129.85 cm, while the smallest plants measured 120.11 cm (Figure 01). Plant height varies among the three varieties since it is a varietal characteristic and a genetic component of the cultivar. The findings align with those of Bisne et al. (2006), who noted a considerable variation in plant height between the varieties.

Number of effective tillers in hill^{-1}: The number of effective tillers in hill^{-1} was largely determined by variety. Figure 01 shows that BRRI Dhan34 had the most effective tillers hill^{-1} (8.62), whereas Nizershail had the fewest effective tillers hill^{-1} (6.82).

Panicle length: The various varieties did not significantly differ in panicle length. In terms of length, variety BRRI dhan34 had the longest panicle length (22.96 cm), while variety Nizershail had the smallest (22.56 cm) (Figure 01).

Number of grains panicles $^{-1}$: The number of panicles varied significantly depending on the variety. Figure 01 shows that the greatest number of grains (152.44) was found in Kalizira, and the lowest number (110.24) was discovered in BRRI dhan34.

1000-grain weight: Different types of rice had a substantial impact on the weight of 1000-grain. The weight of the thousand grains was found to be 20.34 g in Kalizira and 21.22 g in BRRI dhan34 (Figure 01).

Grain yield: In terms of grain yield, the variety under study varied considerably. BRRI Dhan34 produced the highest grain output (5.00 t ha^{-1}) (Figure 01). The lowest number of sterile spikelet panicle^{-1} may be the cause of the higher output. Nizershail produced the least amount of grain (4.13 t ha^{-1}).

Straw yield: Three cultivars had a major effect on straw yield. According to Figure 01, the straw yields in Kalizira (8.77 t ha^{-1}) and BRRI dhan34 (7.35 t ha^{-1}) were the highest and lowest, respectively.

Biological yield: Variety had no discernible impact on biological yield (Figure 01).

Harvest index: Variety has a major impact on the harvest index. The BRRI dhan34 rice variety had the highest harvest index (39.14%), while Kalizira had the lowest harvest index (31.59%) (Figure 01).

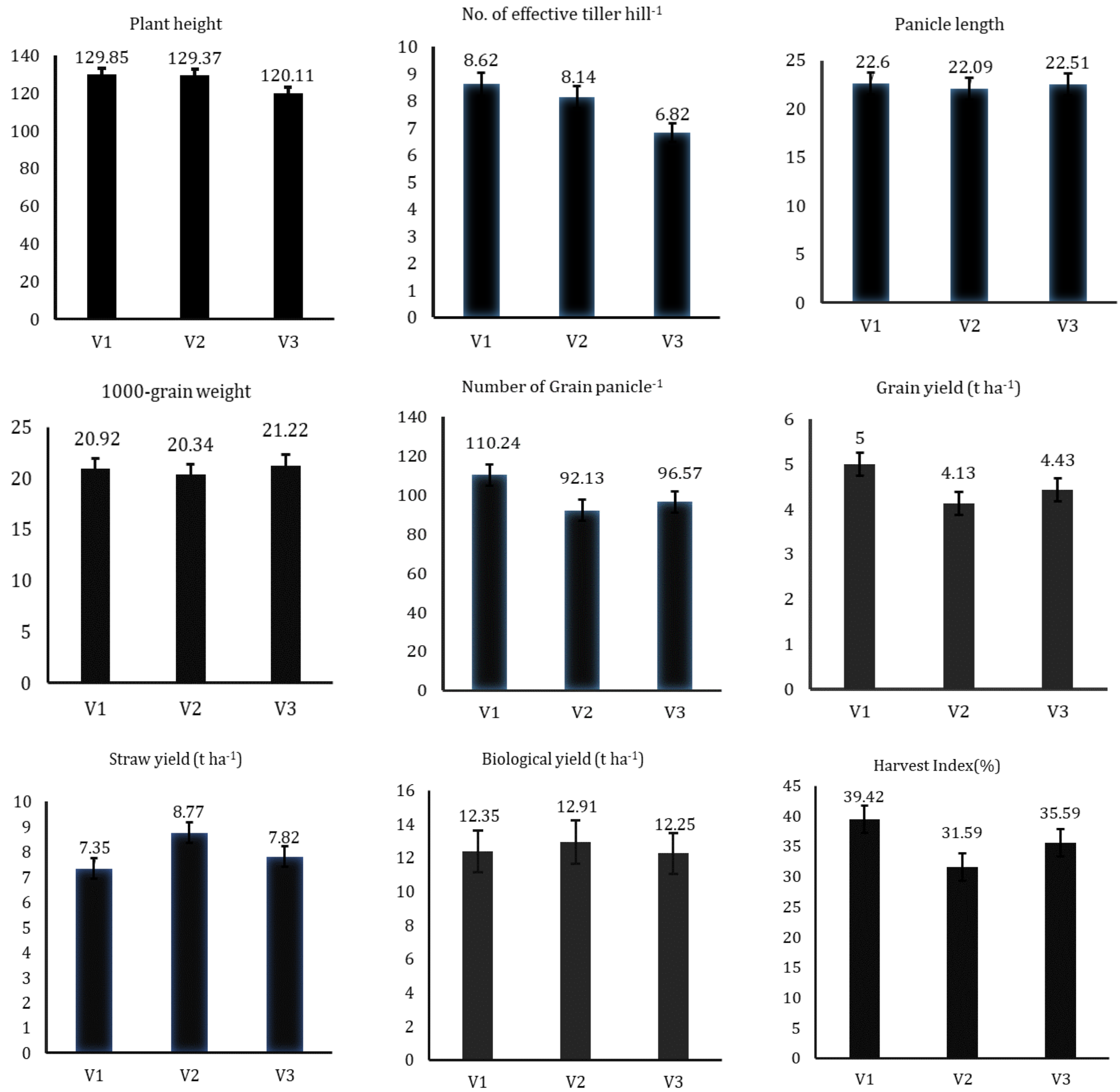


Figure 01. Yield and yield contributing characters at harvest.

Effect of *Artocarpus heterophyllus* leaves residue

Plant height: The residue from *Artocarpus hetrophyllus* leaves did not significantly alter plant height (Figure 02).

Number of effective tillers hill^{-1}: *Artocarpus heterophyllus* leaves residue had a substantial impact on the number of effective tillers hill^{-1}. The R_2 treatment (1.0 t ha^{-1}) generated the greatest number of effective tillers hill^{-1} (10.12). According to Figure 02, the R_1 (no residue) treatment yielded the fewest effective tillers hill^{-1} (5.63).

Panicle length: The residue from *Artocarpus heterophyllus* leaves had a substantial impact on panicle length. In R_2 (1.0 t ha^{-1}) treatment, the longest panicle measured 22.96 cm, while in R_3 (2.0 t ha^{-1}) treatment, the shortest panicle measured 22.56 cm (Figure 02).

Number of grains panicle^{-1}: The residue from *Artocarpus heterophyllus* leaves profoundly affected the number of grain panicles^{-1}. The treatment with R_2 (1.0 t ha^{-1}) generated the most grains panicle^{-1} (110.35), while the treatment with R_1 (no residue) produced the fewest grains panicle^{-1} (89.82). According to Figure 02, it was shown that the presence of weeds inhibited plant growth, whereas the absence of weeds promoted the production of grains panicle^{-1}.

1000-grain weight: The residue of *Artocarpus heterophyllus* leaves had a substantial impact on the weight of 1000 grains. The R_2 (1.0 t ha^{-1}) treatment had the highest 1000-grain weight (21.37 g), while the R_1 (no residue) treatment had the lowest 1000-grain weight (20.55 g) (Figure 02).

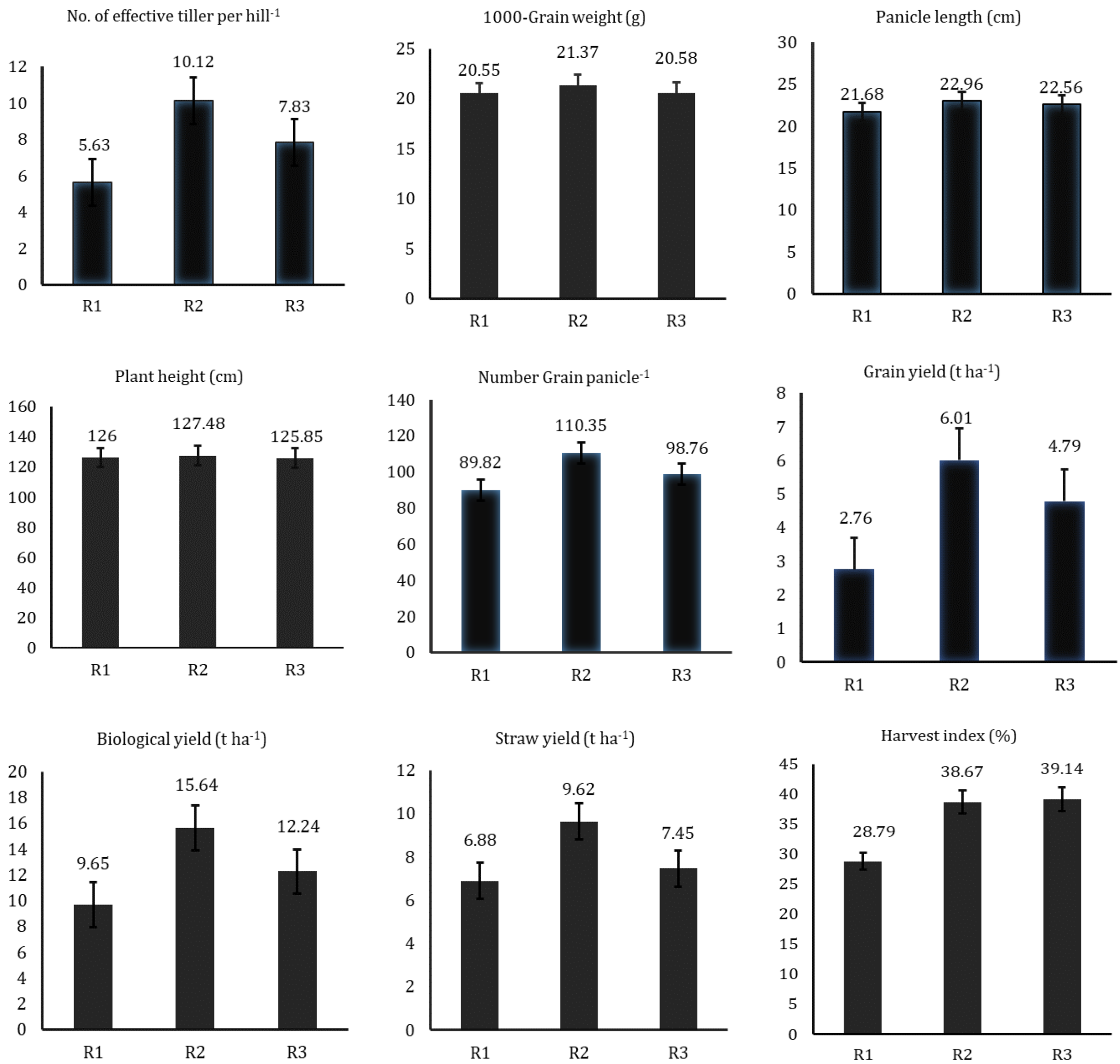


Figure 02. Effect of *Artocarpus heterophyllus* leaves residue.

Grain yield: The residue of *Artocarpus heterophyllus* leaves had a substantial impact on grain yield. According to Figure 02, the R_2 treatment (1.0 t ha^{-1}) provided the maximum grain yield (6.01 t ha^{-1}) while the R_1 treatment (no residue) produced the lowest grain yield (2.76 t ha^{-1}). The rice field's weed emergence was reduced and maximum grain yield was achieved by incorporating 1.0-ton *Artocarpus heterophyllus* leaves residue ha^{-1}. The application of residues may have increased the amount of organic matter in the soil and increased grain output. Conversely, the control plot, which had no residue, had the highest dry weight of weed and the maximum weed population. The crop's output of grain fell as a result of weeds competing with it for nutrients, water, air, sunlight, and space. Similar findings, where agricultural residues affected crop performance, were also reported by Uddin and Pyon (2010).

Straw yield: *Artocarpus heterophyllus* leaf residue had a considerable impact on straw yield. According to Figure 02, the R_1 (no residue) treatment produced the lowest straw yield (6.88 t ha^{-1}) and the 1.0-ton *Artocarpus heterophyllus* leaves residue ha^{-1} treatment produced the greatest (9.62 t ha^{-1}).

Biological yield: The residual leaves of *Artocarpus heterophyllus* influenced biological yield significantly. R_2 (1.0 t ha^{-1}) produced the largest biological output (15.64 t ha^{-1}), while R_1 (no residue) produced the lowest biological yield (9.65 t ha^{-1}) (Figure 02). Climate and the degree of weed infestation determined differences in biological yield amongst weed control treatments. In addition to lowering grain output, increased weed infestation also eventually affected straw yield and biological productivity.

Harvest index: The residue from *Artocarpus heterophyllus* leaves had a substantial impact on the harvest index. According to Figure 02, the R_3 (2 t ha^{-1}) treatment had the highest harvest index (39.14%), while the R_1 (no residue) treatment had the lowest harvest index (28.79%).

Effect of interaction between variety and *Artocarpus heterophyllus* leaf residues

Plant height: Plant height was significantly impacted by the interaction between variety and residue from *Artocarpus heterophyllus* leaves. In terms of height, Nizershail generated the smallest plant height (118.89 cm) in R_1 (no residue) treatment, whereas BRRI dhan34 variety produced the tallest plant (130.55 cm) in R_2 (1.0-ton *Artocarpus heterophyllus* residues ha^{-1}) treatment (Table 01).

Number of effective tillers hill^{-1} : Effective tillers hill^{-1} was significantly impacted by the relationship between variety and *Artocarpus heterophyllus* residues. As shown in Table 01, Kalizira produced the greatest number of effective tillers hill^{-1} (10.74) in the R_2 (1.0 t ha^{-1}) treatment, whereas the V_3R_1 (Nizershail × no residue) treatment combination produced the lowest number of effective tillers hill^{-1} (4.64).

Panicle length: The study found that the interaction between variety and residue of *Artocarpus heterophyllus* leaves did not significantly affect panicle length. However, in terms of numbers, the longest panicle (23.43 cm) was found in the V_1R_2 treatment (BRRI dhan34 × 1.0 t ha^{-1}) and the shortest (21.39 cm) in the V_1R_1 treatment (BRRI dhan34 × no residue) (Table 01).

Number of grains panicle^{-1}: The interaction between variety and residues had a major impact on the number of grains panicle^{-1}. The treatment V_1R_2 (BRRI dhan34 × 1.0 t ha^{-1}) produced the most grains (126.37), while the treatment V_2R_1 (Kalizira × no residue) produced the fewest grains (83.61) (Table 01).

1000-grain weight: The interplay between variety and residues had a considerable impact on the weight of the 1000-grain. It appears that the V_3R_2 (Nizershail × 2.0 t ha^{-1}) treatment had the highest 1000-grain weight (22.25 g), whereas the V_2R_1 (Kalizira × no residue) treatment had the lowest weight (20.28 g) (Table 01).

Grain yield: There was a strong relationship between residues and varieties that affected grain yield. V_1R_2 (BRRI dhan34 × 1.0 t ha^{-1}) provided the largest number of grain yield (7.06 t ha^{-1}), while V_2R_1 (Kalizira × no residue) produced the lowest number of grain yield (2.5 t ha^{-1}) (Table 01). Because of intense weed infestation in the plots caused by competition for moisture and nutrients between weed and rice plants, the lowest grain yield ha^{-1} in the control plot may be the result of yield contributing characters performing poorly, such as number of tillers hill^{-1} and grain panicle^{-1}. Gogoi et al. (2000) reported similar outcomes.

Straw yield: The combination of residues and variety has a major impact on straw yield. The V_2R_2 (Kalizira × 1.0 t ha^{-1}) treatment yielded the maximum straw yield (10.92 t ha^{-1}), while the V_3R_1 (Nizershail × no residue) treatment provided the lowest straw yield (6.57 t ha^{-1}) on Table 01.

Biological yield: The relationship between residues and variety has a significant impact on biological yield. V_2R_2 (Kalizira× 1.0 t ha^{-1}) provided the maximum biological yield (16.13 t ha^{-1}), while V_3R_1 (Nizershail × no residue) produced the lowest biological yield (9.36 t ha^{-1}) (Table 01).

Harvest index: The interaction between residues and variety has a considerable impact on the harvest index. According to Table 01, the V_1R_2 treatment (BRRI dhan34 × 1 t ha^{-1}) had the highest harvest index (45.87%), whereas the V_2R_1 treatment (Kalizira × no residue) had the lowest harvest index (25.17%).

Table 01. Interaction effect of variety and *Artocarpus heterophyllus* leaves residue

Interaction	Plant height (cm)	Number of total tiller $hill^{-1}$	Number of effective tiller $hill^{-1}$	Number of non-effective tiller $hill^{-1}$	Panicle length (cm)	Grain $panicle^{-1}$	Number of sterile spikelets	1000 grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
V_1R_1	130.45a	10.33c	7.04c	3.29a	21.39	89.87def	11.65abc	20.76bc	3.01d	6.63d	9.65c	31.27cde
V_1R_2	130.55a	12.70a	10.56a	2.14c	23.43	126.37a	7.64bc	21.36b	7.06a	8.38bc	15.44a	45.87a
V_1R_3	128.56ab	11.41abc	8.27bc	3.14a	22.98	114.46b	9.37abc	20.66bc	4.93bc	7.04cd	11.98b	41.13ab
V_2R_1	128.67ab	8.66de	5.23de	3.43a	21.51	83.61f	13.66a	20.28c	2.50d	7.44cd	9.94c	25.17e
V_2R_2	131.67a	12.33ab	10.74a	1.59c	22.66	104.68bc	6.58c	20.50c	5.21bc	10.92a	16.13a	32.46cde
V_2R_3	127.78abc	10.78bc	8.44bc	2.33bc	22.11	88.09ef	13.22a	20.25c	4.70c	7.97bcd	12.67b	37.13bcd
V_3R_1	118.89c	7.94e	4.64e	3.30a	22.14	95.99cde	9.46abc	20.60bc	2.79d	6.57d	9.36c	29.94de
V_3R_2	120.22bc	11.22abc	9.06ab	2.16c	22.81	100.01cd	6.88c	22.25a	5.77b	9.57ab	15.34a	37.67bcd
V_3R_3	121.22bc	9.89cd	6.77cd	3.11ab	22.59	93.73def	12.32ab	20.81bc	4.73c	7.33cd	12.07b	39.15abc
$LSD_{(0.05)}$	9.18	1.65	1.68	0.81	1.33	10.67	5.13	0.83	0.95	1.72	1.64	7.92
Level of Sig.	**	**	**	**	NS	**	**	**	**	**	**	**
CV%	4.20	9.01	12.40	17.11	3.45	6.19	19.38	2.32	12.23	12.50	7.58	12.89

In a column, figures with the same letter do not differ significantly as per DMRT. ** = Significant at 1% level of probability, * =Significant at 5% level of probability and NS = Not significant

V. Conclusion

The number of total tillers $hill^{-1}$, the number of ineffective tillers $hill^{-1}$, the number of grains $panicle^{-1}$, the number of sterile spikelets $panicle^{-1}$, and the grain yield were all significantly impacted by variety. Because of its better grain production, more grains $panicle^{-1}$, and more effective tillers $hill^{-1}$, BRRI dhan34 had the maximum grain yield. However, because the Kalizira variety had more sterile spikelets $panicle^{-1}$, it yielded the least amount of grain. Additionally, residues have significant impact on yield and features that contribute to yield. Because there were more effective tillers $hill^{-1}$, more grain $panicle^{-1}$, and less sterile spikelets $panicle^{-1}$ produced in the 1.0 t ha^{-1} treatment, the grain yield was highest in that treatment. Because there were less effective tillers $hill^{-1}$, fewer grain $panicle^{-1}$, and more sterile spikelets $panicle^{-1}$ in the R_1 condition, the lowest grain yield was generated. The relationship between variety and residues had a significant impact on yield and yield-contributing traits including effective tillers $hill^{-1}$, grains $panicle^{-1}$, and grain yield. The variety that provided the highest grain and straw yield was BRRI dhan34, treated at a rate of 1.0 t ha^{-1}. Under R_1 treatment, the Kalizira cultivar produced the lowest grain yield. Based on the aforementioned findings, it was determined that the R_2 (*Artocarpus heterophyllus* residue at 1 t ha^{-1}) treatment and the variety BRRI dhan34 had the best outcomes. As a result, leftover *Artocarpus heterophyllus* leaves may one day be used as a weed-management technique to support sustainable agricultural production.

References

[1]. Abbas, T., Ahmad, A., Kamal, A., Nawaz, M. Y., Jamil, M. A., Saeed, T. and Ateeq, M. (2021). Ways to use allelopathic potential for weed management: a review. International journal of agricultural sciences, 5, 492-498. https://doi.org/10.26855/ijfsa.2021.09.020

[2]. Ahmed, S., Hassan, G. and Baloch, M.S. (2005). Weed Management in Direct Seeded Rice Crop. Indian Journal Weed Science Research, 13(3-4), 219-226.

[3]. Ahmed, N., Bunting, S. W., Rahman, S. and Garforth, C. J. (2014). Community-based climate change adaptation strategies for integrated prawn–fish–rice farming in Bangladesh to promote

social–ecological resilience. Reviews in Aquaculture, 6(1), 20-35. https://doi.org/10.1111/raq.12022
[4]. Bisne, R., Motiramani, N. K. and Sarawgi, A. K. (2006). Identification of high yielding hybrids in rice. Bangladesh journal of agricultural research, 31(1), 171-174.
[5]. Bhuler, D. D., Netzer, D. A., Riemenschneider, D. E. and Hartzler, R. G. (1998). Weed management in short rotation poplar and herbaceous perennial crops grown for biofuel production. Biomass and Bioenergy, 14(4), 385-394. https://doi.org/10.1016/S0961-9534(97)10075-7
[6]. FAO and UNDP (1988). Land Resources Appraisal of Bangladesh for Agricultural Development Report 2: Agroecological Regions of Bangladesh.
[7]. Gogoi, A. K., Rajkhowa, D. J. and Kandali, R. (2000). Effect of varieties and weed-control practices on rice (Oryza sativa) productivity and weed growth. Indian Journal of Agronomy, 45(3), 580-585. https://doi.org/10.59797/ija.v45i3.3418
[8]. Gomez, K. A. and Gomez, A. A. (1984). Statistical procedures for agricultural research. John wiley & sons, 202-215.
[9]. IRRI (2022). STRASA Legacy site, 12.
[10]. Paul, N. C., Paul, S. C., Paul, S. K. and Salam, M. A. (2021a). Response of nitrogen and potassium fertilization on the growth performance of aromatic Boro rice. Archives of Agriculture and Environmental Science, 6(3), 303-309. https://doi.org/10.26832/24566632.2021.060306
[11]. Paul, N. C., Tasmim, M. T., Imran, S., Mahamud, M. A., Chakrobortty, J., Rabbi, R. H. M. and Paul, S. K. (2021b). Nutrient management in fragrant rice: a review. Agricultural Sciences, 12(12), 1538-1554. https://doi.org/10.4236/as.2021.1212098
[12]. Prasad, K. and Rafey, A. (1995). Effect of integrated weed management on weed growth, nutrient uptake, economics and energetics in rainfed upland rice (*Oryza sativa*). Indian Journal Agricultural Science, 65(4), 260- 264.
[13]. Sathyamoorthy, N. K., Mahendran, S., Babu, R. and Ragavan, T. (2004). Effect of integrated weed management practices on total weed dry weight, nutrient removal of weeds in rice-rice wet seeded system. Journal of Agronomy, 3, 263-267. https://doi.org/10.3923/ja.2004.263.267
[14]. Uddin, M. R. and Pyon, J. Y. (2010). Herbicidal activity of rotation crop residues on weeds and selectivity to crops. Korean Journal of Agricultural Science, 37(1), 1-6.

HOW TO CITE THIS ARTICLE?

MLA
Fiza, F. et al. "Weed management and yield performance of T. *Aman* rice as influenced by *Artocarpus heterophyllus* leaf residues". Asian Journal of Crop, Soil Science and Plant Nutrition, 10(01), (2024):387-394.

APA
Fiza, F., Begum, M., Mia, M. L., Das, B., Ahmed, S., Shimo, F. J., Tanim, K. M. Y., Datta, P., Talukder, S. K. and Islam, M. S. (2024). Weed management and yield performance of T. *Aman* rice as influenced by *Artocarpus heterophyllus* leaf residues. *Asian Journal of Crop, Soil Science and Plant Nutrition*, 10(01), 387-394.

Chicago
Fiza, F., Begum, M., Mia, M. L., Das, B., Ahmed, S., Shimo, F. J., Tanim, K. M. Y., Datta, P., Talukder, S. K. and Islam, M. S. "Weed management and yield performance of T. *Aman* rice as influenced by *Artocarpus heterophyllus* leaf residues". Asian Journal of Crop, Soil Science and Plant Nutrition, 10(01), (2024): 387-394.

Harvard
Fiza, F., Begum, M., Mia, M. L., Das, B., Ahmed, S., Shimo, F. J., Tanim, K. M. Y., Datta, P., Talukder, S. K. and Islam, M. S. 2024. Weed management and yield performance of T. *Aman* rice as influenced by *Artocarpus heterophyllus* leaf residues. Asian Journal of Crop, Soil Science and Plant Nutrition, 10(01), pp. 387-394.

Vancouver
Fiza, F, Begum, M, Mia, ML, Das, B, Ahmed, S, Shimo, FJ, Tanim, KMY, Datta, P, Talukder, SK and Islam, MS. Weed management and yield performance of T. *Aman* rice as influenced by *Artocarpus heterophyllus* leaf residues. Asian Journal of Crop, Soil Science and Plant Nutrition, June 2024 10(01), 387-394.