***Original Research Article***

**Weed Growth Observation in Transplant *Aman* Rice Field as Influenced by the Organic Manures and Fertilizers with Rice Straw Allelopathy**

**ABSTRACT**

The present experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh from June 2022 to November 2022 to estimate the combined effect of manures and fertilizers with the rice straw allelopathy on the weed growth of transplant *aman* rice season. It had two cultivars *viz.,* BRRI dhan71 (V1), and BRRI dhan49 (V2) and eight treatments comprising with rice straw, manures and fertilizers (t ha-1): Control (T1), Recommended doses of NPKS (T2), Rice straw 1.5 t ha-1 + Cow dung 5 t ha-1 (T3), Rice straw 1.5 t ha-1 + Cow dung 2.5 t ha-1 + 50% less of recommended doses of NPKS (T4 ), Rice straw 1.5 t ha-1 + Vermicompost 5 t ha-1 (T5), Rice straw 1.5 t ha-1 + Vermicompost 2.5 t ha-1 + 50% less of recommended doses of NPKS (T6), Rice straw 1.5 t ha-1 + Trichocompost 10 t ha-1 (T7), Rice straw 1.5 t ha-1 + Trichocompost 5 t ha-1 + 50% less of recommended doses of NPKS (T8) and was laid out in a randomized complete block design (RCBD) with three replications. Nine weed species belonging to four different families infested the experimental plots. Weed population and weed dry weight were significantly affected by treatments. The maximum weed growth was obtained from Control (T1) while the minimum was found in (T6). Results of this current study indicate that combination of rice straw with manures and fertilizer showed potentiality to inhibit weed growth and enhances the yield of transplant *aman* rice. Therefore, combination of rice straws with manures and fertilizers could be a potential package of sustainable and eco-friendly weed management and yield enhancement element for the nearest year’s crop production.

Keywords*: Allelopathy; INM; Organic farming; Rice straw; Yield performance.*

1. INTRODUCTION

“Rice is the world’s most important staple food and will continue to be so in the coming decades. A staple food for some 4 billion people worldwide, rice provides 27% of the calories in low and middle-income countries. With expected population growth, income growth, and decline in rice area, global demand for rice will continue to increase from 479 million tons of milled rice in 2014 to 536-551 million tons in 2030” (Rice Agri-Food System, Rice, 2023)

“Agriculture comprises about 11.38% of the total GDP and this sector employs around 45.33% of total labor force of Bangladesh” (BBS, 2023). “Bangladesh ranks 3rd position in rice production among rice growing countries of the world with 37 million metric tons in 2023-2024 that constitute about 7% of global production in 2023-2024” (USDA, 2024). “Rice cultivation covers about 11.64 million ha area with annual production about 39.095 million tons” (BBS, 2023). “The population of Bangladesh is increasing very rapidly, whereas the total rice production area is continuously declining due to urbanization and industrialization. Therefore, it is an urgent need to increase rice production through increasing yield. Global agricultural production may need to increase 60-110% to meet increasing demands and provide food security by 2050” (Deepak et al., 2013). “An imbalanced use of inorganic fertilizers and pesticides without organic fertilizers has led to deterioration of soil health and crop yield loss which has become a concern. The soil productivity in many Asian countries, including Bangladesh, has been hampered by an increased reliance on chemical fertilizers and unbalanced nutrient management techniques. Increased the cropping intensity and regular cultivation of high-yielding rice varieties has increased the removal of nitrogen (N), phosphorus (P), potassium (K), and other macro- and micro-nutrients from the soils in Bangladesh” (Saleque et al., 2004). “Soil OM content is reported to be declining, which is considered as one of the most serious threats in Bangladesh agriculture” (Rahman et al., 2020).  “Management practices, such as diversified cropping systems and the application of different organic wastes and optimum fertilization, are believed to offer high potential for increasing the nutrient-use efficiency, carbon levels in soils, and the crop yield” (Rahman, 2013). “A large amount of N fertilizer is used to increase soil fertility and crop productivity. Excess N may enhance mineralization of OM, which may decrease soil C content and increase in carbon dioxide (CO2) emission. If the present rate of its degradation is continued, in the near future, the soil would become barren. Cowdung, vermicompost and Trichocompost are the potential organic sources of soil organic C and plant nutrients” (Suthar, 2009). “The integration of all organic and inorganic sources of nutrients is an efficient and environmentally friendly technology of crop production which is known as integrated nutrient management (INM).  Weeds cause substantial decline in rice production. In our country, weed infestation reduces the grain yield by 70-80% in *aus* rice, 30-40% for transplant *aman* rice and 22-36% for modern *boro* rice varieties” (BRRI, 2008). “It competes with rice plant for light, nutrients, space and water. As a result, grain yield of rice become affected due to weed. The prevailing climatic and edaphic conditions are very much favorable for luxuriant growth of numerous species of weeds that strongly compete with rice plant.

Herbicides are effective in controlling weeds alone or in combination with hand weeding but it is harmful for the nature” (Ahmed et al., 2005). “Herbicides in combination with hand weeding would help to obtain higher crop yield but its efforts high cost of production” (Sathyamoorthy et al., 2004). In all rice ecosystems, herbicides have become one of the most important components in weed control. The application of pre-emergence and post-emergence herbicides could effectively control weeds at low cost in rice fields but intensive and repeated use of herbicides can cause environmental pollution and development of resistant weed biotypes because the weed-rice ecological relationship is very complex and dynamic.

Researchers are focusing more on employing various plant residues to inhibit weed growth through their allelopathic actions in order to combat weed infestation. Rice has been thoroughly studied with respect to its allelopathy and many rice varieties were observed to inhibit the growth of several weed species. Chung et al. (2001) identified “p-hydroxy benzoic acid, p-coumeic acid, ferulic acid, syringic acid and vankmillic acid from rice cultivars”. Kato-Noguchi *et al.* (2002) identified momilactone *β* from Japanese rice cultivar. Koshihikari et al. (2009), Salam & Kato-Noguchi (2011) and Kato-Noguchi et al. (2011) identified “9-hydroxy-*β*-ionone and 3-oxo-*α*-ionol from Bangladeshi rice cultivar BR17 and Kartikshail. These compounds inhibited the growth of the barnyard grass at lower concentration. So, keeping above facts in mind, present experiment was carried out to know the suppression of weed growth through the application of rice straw residues with manures and fertilizers in T. aman rice field”.

2. material and methods

**2.1 Experimental Site**

Under the Sonatola series of the Old Brahmaputra Floodplain, the experimental field was situated in non-calcareous dark grey floodplain soil which was located at 90°50' E longitude, 24°25' N latitude and 18 m above sea level elevation and it is called AEZ-9, the Agro-ecological region of the Old Brahmaputra Floodplain (Kundu et al., 2022). The land had a silty loam texture and was classified as medium-high. Soil’s physical and chemical properties of the experimental site is displayed in Table 1. The weather for the experimentation period, including the monthly average air temperature (°C), relative humidity (%), rainfall (mm), and sunshine (hours), has been provided in Table 2.

**Table 1. Soil properties of the experimental field**

|  |  |  |  |
| --- | --- | --- | --- |
| **Soil Properties** | | | |
| **Physical** | | **Chemical (0-15 cm depth)** | |
| Major land Type | MH-ML | Soil pH | 6.5 |
| OM | L-M | Sand (%) (0.0-0.02 mm) | 21.75 |
| Particle Size | 2.57 | Organic matter (%) | 1.30 |
| Bulk Density (g/ce) | 1.42 | Total nitrogen (%) | 0.10 |
| Porosity (%) | 44.7 | Available phosphorus (ppm) | 27 |
| Sand (%) | 21.75 | Exchangeable potassium (me %) | 0.12 |
| Silt (%) | 66.60 | Available Sulphur (ppm) | 22.7 |
| Clay (%) | 11.65 |  |  |
| Color | Dark grey |  |  |
| Consistency | Granular |  |  |
| Soil Textural class | Silt loam |  |  |

MH-ML = Medium high to medium low, OM = Organic matter.

Source: Soil Science department, Bangladesh Agricultural University, Bangladesh

**Table 2. Distribution of monthly average air temperature, relative humidity, rainfall and sunshine hours of the experiment site during the period from July 2022 to November 2022**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Month** | **Monthly air temperature (0C)** | | | **Relative humidity (%)** | **Rainfall**  **(mm)** | **Sun shine  (hrs.’)** |
| **Maximum** | **Minimum** | **Average** |
| July | 33.2 | 27.2 | 30.2 | 82.4 | 115 | 185.7 |
| August | 33.4 | 26.9 | 30.2 | 81.5 | 217 | 206.6 |
| September | 32.4 | 26.1 | 29.3 | 87.7 | 349.9 | 123.6 |
| October | 32.0 | 24.0 | 28.0 | 84.7 | 240.3 | 211.0 |
| November | 30.4 | 18.3 | 24.4 | 81.6 | 0.0 | 265.2 |

Source: Weather Yard, Department of Irrigation and Water Management, Bangladesh Agricultural University, Mymensingh.

**2.2 Experimental Treatments and Set Up**

There were two factors of the experimental treatment. Such as, Factor A: Rice Varieties (2): BRRI dhan71 (V1), BRRI dhan49 (V2). Factor B: Fertilizers and manures combining with rice straw residues (t ha-1): Control (T1), Recommended doses of NPKS (N = 0.115, P = 0.0264, K = 0.0623, S = 0.018) (T2), Rice straw 1.5 + Cow dung 5 (T3), Rice straw 1.5 + Cow dung 2.5 + 50% less of recommended doses of NPKS (T4), Rice straw1.5 + Vermicompost 5 (T5), Rice straw 1.5 t + Vermicompost 2.5 + 50% less of recommended doses of NPKS (T6), Rice straw 1.5 + Trichocompost 10 (T7), Rice straw 1.5 + Trichocompost 5 + 50% less of recommended doses of NPKS (T8). The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Each block was divided into 16 unit plots of 2 m × 2.5 m size. The distance maintained between two unit plots was 0.5 m and between blocks was 1 m. BRRI dhan49 and BRRI dhan71 were used as test crop variety in the experiment. The rice straws and Cowdung were collected from the Agronomy Field Laboratory Bangladesh Agricultural University (BAU), Mymensingh. After collection, the rice straws were dried and then cut to small pieces by using a sickle. Vermicompost and Trichocompost were collected from Horticulture Farm, BAU and Agroholic Farm, Rajshahi respectively.

**2.3** **Crop Husbandry**

The land was then puddled thoroughly by ploughing with a tractor followed by laddering in order to level the soil. Weeds were collected along with stubbles and crop residues of the previous crops were collected and removed from the land. Rice straw residues were applied at 7 days before transplanting of *aman* rice at the time of final land preparation, after that rice straws were mixed well to the respective plots with a spade. Cowdung, Vermicompost and Trichocompost was applied as basal dose as per treatment, while fertilizers were applied as per recommended dose (kg ha-1) Urea 250, TSP 125, MoP 125 and Gypsum 100 (FRG, 2018). The entire amounts of triple super phosphate, muriate of potash and gypsum were applied at the time of final land preparation. Urea was applied as top dressing in three installments at 15, 30 and 45 days after transplanting (DAT). 40 days old seedlings were transplanted on 1 August 2022 in the well prepared puddled land at the rate of 3 seedlings hill-1 maintaining row and hill distances of 25 cm and 15 cm respectively.Gap filling was done after 7 DAT (days of transplanting) with seedlings from the same source. Experimental plots were irrigated as and when necessary. Excess water was drained out from the plots before 15 days harvesting for enhancement of the maturity of the crops. Weed density and dry weight data were collected from every experimental plot at 25 and 50 DAT. The crops were harvested when they reached full maturity. When 90% of the grains turned a golden yellow color, the crops were considered mature. On November 20, 2022, both the BRRI dhan71 and BRRI dhan49 varieties were harvested. 3 hills polt-1 (except border hills) were randomly selected from each plot for taking data on yield and yield contributing characters of rice. Then central 1 m2 area of each plot was harvested for obtaining grain and straw yield of rice. 14% moisture content was eventually fixed after cleaning the grains then the recorded data on grain and straw yield were converted to t ha-1 after sun dried.

**2.4 Sampling and Measurement**

**2.4.1 Weed density**

A 0.25 m × 0.25 m quadrate was used to collect data on the population of weeds from each plot of the experiment at 25 and 50 DAT, following the procedure was outlined by Cruz et al. (1986).

**2.4.2 Weed dry weight**

After a weed count of quadrate, the weeds were pulled up, cleaned, categorized by species, and initially dried under the sunlight and later in an electric oven for 72 hours at 80°C. Dry weight of weed was taken by using an electric balance.

**2.5 Collection and Calculation of Data**

**2.5.1 Plant growth and yield contributing parameters**

Five randomly chosen sample plants from each plot were used to record data on yield and yield-contributing characteristics. The parameters which were measured by cm: Plant height, Panicle length, by hill-1: number of total tillers, number of effective tillers, number of non-effective tillers, by panicle-1, number of grains, number of sterile spikelets, by t ha-1: grain yield, straw yield, biological yield, and others: 1000-grain weight (g), harvest index (%).

**2.5.2 Harvest index (%)**

The correlation between grain yield and biological yield is known as the harvest index. The following formula was used to determine the harvest index:

**2.6 Statistical Analysis**

To prepare for statistical analysis, the captured data were collated and tabulated. By the MSTAT-C computer software, analysis of variance was conducted. The Duncan's Multiple Range Test was used to determine the mean differences among the treatments (Gomez & Gomez, 1984).

**3. RESULT**

**3.1 Weed Dynanics**

Nine weed species belonging to four families infested the experimental field. The weeds in the experimental plots were Shama (*Echinochloa crus-galli*), Panikachu (*Monochoria vaginalis*), Panichaise (*Eleocharisatro purpurea*), Amrul shak (*Oxalis europaea),* Sabuj nakful (*Cyperus difformis*), Joina (*Fimbristyis miliaceae*), Angulee (*Digitaria sanguinalis*), Kachuripana (*Eichhornia crassipes*) and Arail (*Leersia hexandra*). Among the weed species three were grass, three were sedge and three were broadleaf. There were five weeds belonging to annual and four weeds belonging to perennial in the experimental plots. Rahman et al. (2022); Khatun et al. (2019), in their experiments at Bangladesh Agricultural University, reported that the four important weeds of rice fields were Shama (*Echinochola crusgali*), Anguli (*Digitaria sanguinalis*), Topapana(*Pistia stratiotes*), and Angta(*Paspalum scrobiculatum*). The local name, scientific name, family, morphological type and life cycle of the weeds in the experimental plots have been presented in Table 3.

**Table 3. Weed species observed in the experimental rice plots**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.**  **No.** | **Local Name** | **English**  **Name** | **Scientific Name** | **Family**  **Name** | **Morphological**  **Type** | **Life**  **cycle** |
| 1 | Shama | Burnyard grass | *Echinochloa crus-galli* | Poaceae | Grass | Annual |
| 2 | Angulee | Crab grass | *Digitaria sanguinalis* L. | Poaceae | Grass | Annual |
| 3 | Arail | Swamp rice grass | *Leersia hexandra* Sw. | Poaceae | Grass | Annual |
| 4 | Pani chaise | Purple spike rush | *Eleocharisatro purpurea* | Cyperaceae | Sedge | Annual |
| 5 | Joina | Grass like fimbry | *Fimbristyis miliaceae* L. | Cyperaceae | Sedge | Perennial |
| 6 | Sabuj nakful | Small flower umbrella grass | *Cyperus difformis* L. | Cyperaceae | Sedge | Perennial |
| 7 | Amrulshak | Indian sorrel | *Oxalis europaea* Jord | Oxalidaceae | Broadleaf | Annual |
| 8 | Kachuripana | Water hyacinth | *Eichhornia crassipes* | Pontederiaceae | Broadleaf | Perennial |
| 9 | Panikachu | Pickerel weed | *Monochoria vaginalis* | Pontederiaceae | Broadleaf | Perennial |

**3.2 Effect of Variety**

The effect of cultivar on weed density was non-significant at 25 days after transplanting (DAT). Numerically, the highest weed density (15.63 no. m-2) was found in V2 (BRRI dhan49) and the lowest weed density (14.67 no. m-2) was found in V1 (BRRI dhan71). But it became significant at 50 DAT. The highest (18.51 no. m-2) weed density was observed in V2 (BRRI dhan49) while the lowest weed density (14.20 no. m-2) was found in V1 (BRRI dhan71) at 50 DAT (Table 4). The effect of cultivar on weed dry weight was non-significant at 25 DAT. Numerically, the highest weed dry weight (9.08 g m-2) was found inV2 (BRRI dhan49) and the lowest weed dry weight (8.99 g m-2) was obtained in V1 (BRRI dhan71) at 25 DAT (Table 4). The second weed dry weight calculation was significant at 50 DAT. It means that weed dry weight was affected by variety. The dry weight of weed was the highest (14.66 g m-2) in V2 (BRRI dhan49) and the lowest (12.71 g m-2) was observed in V1 (BRRI dhan71) at 50 DAT (Table 4).

**Table 4. Effect of variety on weed density**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variety** | **Weed density (no. m-2)** | | **Weed dry weight**  **(g m-2)** | |
| **25 DAT** | **50 DAT** | **25 DAT** | **50 DAT** |
| V1 | 14.67 | 14.20b | 8.99 | 12.71b |
| V2 | 15.63 | 18.51a | 9.08 | 14.66a |
| LSD (0.05) | 1.36 | 0.83 | 0.50 | 1.12 |
| Level of Significance | NS | \*\* | NS | \*\* |
| CV% | 15.28 | 18.84 | 9.53 | 13.98 |

In a column, figures with the same letter do not differ significantly as per DMRT.

\*\* = Significant at 5% level of probability, NS = Not significant and DAT = Days after transplanting

*V1 = BRRI dhan71, V2= BRRI dhan49*

**3.3 Effect of Manures and Fertilizers with Rice Straw**

Weed density was significantly affected by manures and fertilizers with rice straw at both 25 DAT and 50 DAT. Weed population was found highest (18.91 no. m-2) at T1 and lowest (11.27 no. m-2) at T6 at 25 DAT (Table 3). Even after 50 DAT weed density was highest (9.13 no. m-2) at T1 followed by 8.76 no. m-2 at T8 and lowest (6.02 no. m-2) at T6 (Table 5).

Weed dry weight was significantly affected by manures and fertilizers with rice straw at both 25 DAT and 50 DAT. The highest weed dry weight (12.44 g m-2) was obtained from T1 and the lowest one (7.80 g m-2) from T7 that was statistically similar to 7.84 g m-2 found in T6 at 25 DAT (Table 5). Again at 50 DAT, the highest weed dry weight (16.44 g m-2) was found at T1 followed by 15.18 g m-2 in T3 and lowest (11.20 g m-2) in T6 (Table 5).

**Table 5. Effect of manures and fertilizers with rice straw on weed density**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Treatments** | **Weed density (no. m-2)** | | **Weed dry weight (g m-2)** | |
| **25 DAT** | **50 DAT** | **25 DAT** | **50 DAT** |
| T1 | 18.91a | 9.13a | 12.44a | 16.44a |
| T2 | 14.20b | 6.40c | 8.19cd | 13.89bc |
| T3 | 15.71b | 7.50abc | 9.01b | 15.18ab |
| T4 | 13.70bc | 7.33bc | 9.58b | 14.19abc |
| T5 | 13.48bc | 7.67abc | 8.16cd | 13.64bc |
| T6 | 11.27c | 6.02c | 7.84d | 11.20d |
| T7 | 15.39b | 7.33bc | 7.80d | 12.60cd |
| T8 | 16.51ab | 8.76ab | 9.29bc | 12.33cd |
| LSD (0.05) | 2.73 | 1.67 | 1.01 | 2.25 |
| Level of Significance | \*\* | \*\* | \*\* | \*\* |
| CV% | 15.28 | 18.84 | 9.53 | 13.98 |

In a column, figures with the same letter do not differ significantly as per DMRT.

*\*\* = Significant at 5% level of probability, NS = Not significant and DAT = Days after transplanting. T1 = Control, T2 = Recommended doses of NPKS (N = 115 kg ha-1, P = 26.40 kg ha-1, K = 62.25 kg ha-1, S =18 kg ha-1), T3 = Rice straw 1.5 t ha-1 + Cow dung 5 t ha-1, T4 = Rice straw 1.5 t ha-1 + Cow dung 2.5 t ha-1 + 50% less of recommended doses of NPKS, T5 = Rice straw 1.5 t ha-1 + Vermicompost 5 t ha-1 , T6 = Rice straw 1.5 t ha-1 + Vermicompost 2.5 t ha-1 + 50% less of recommended doses of NPKS , T7 = Rice straw 1.5 t ha-1 + Trichocompost 10 t ha-1, T8 = Rice straw 1.5 t ha-1 + Trichocompost 5 t ha-1 + 50% less of recommended doses of NPKS*

**3.4 Interaction Effect of Variety, Manures and Fertilizers with Rice Straw**

The combined effect of interaction among variety, manures and fertilizers with rice straw was found significant for the weed density at both 25 DAT and 50 DAT. The highest weed population (19.12 m-2) was found in V2T1 combination which is statistically similar to V2T8,V1T1,andV1T8 by18.91 m-2, 18.51 m-2, and 18.16 m-2 respectively and the lowest weed population (11.27 m-2) was obtained from V1T6 combination at 25 DAT (Table 6). Again, second time weed population were calculated at 50 DAT. There the highest weed density (10.27 m-2) was obtained from V2T1 combination and the lowest weed population (5.00 m-2) was found in V1T6 combination (Table 6). The combined effect of interaction among variety, manures and fertilizers with rice straw was found significant for the weed dry weight at both 25 DAT and 50 DAT. The highest weed dry weight (15.59 g m-2) was found in V2T1 combination followed by 11.52 g m-2 dry weed was obtained from V1T1 combination and the lowest weed dry weight (6.63 g m-2) was obtained from V1T6 combination at 25 DAT (Table 6). Again, second time weed dry weight was calculated at 50 DAT. There the highest weed dry weight (19.57 g m-2) was obtained from V2T1 combination and the lowest weed dry weight (9.06 g m-2) was found in V1T6 combination (Table 6).

**Table 6. Combined effect of interaction among the variety, manures and fertilizer with rice straw on weed density dry weight**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Interaction** | **Weed density (no. m-2)** | | **Weed density (no. m-2)** | |
| **25 DAT** | **50 DAT** | **25 DAT** | **50 DAT** |
| V1T1 | 18.51a | 8.00abcd | 18.51a | 8.00abcd |
| V1T2 | 14.20b | 7.43bcde | 14.20b | 7.43bcde |
| V1T3 | 15.71b | 7.19ab | 15.71b | 7.19ab |
| V1T4 | 15.39b | 6.00def | 15.39b | 6.00def |
| V1T5 | 13.70bc | 6.35cdef | 13.70bc | 6.35cdef |
| V1T6 | 11.27c | 5.00f | 11.27c | 5.00f |
| V1T7 | 13.48bc | 6.00def | 13.48bc | 6.00def |
| V1T8 | 18.16a | 7.33bcdef | 18.16a | 7.33bcdef |
| V2T1 | 19.12a | 10.27a | 19.12a | 10.27a |
| V2T2 | 15.11b | 9.00ab | 15.11b | 9.00ab |
| V2T3 | 17.11b | 8.33abcd | 17.11b | 8.33abcd |
| V2T4 | 15.98bc | 8.66abc | 15.98bc | 8.66abc |
| V2T5 | 14.88bc | 7.66bcde | 14.88bc | 7.66bcde |
| V2T6 | 13.11a | 5.37ef | 13.11a | 5.37ef |
| V2T7 | 15.71b | 6.66abc | 15.71b | 6.66abc |
| V2T8 | 18.91a | 7.05bcdef | 18.91a | 7.05bcdef |
| LSD(0.05) | 3.86 | 2.36 | 3.86 | 2.36 |
| Level of Significance | \*\* | \*\* | \*\* | \*\* |
| CV% | 15.28 | 18.84 | 15.28 | 18.84 |

In a column, figures with the same letter do not differ significantly as per DMRT.

*\*\* = Significant at 5% level of probability, NS = Not significant and DAT = Days after transplanting, V1 = BRRI dhan71, V2= BRRI dhan49 and T1 = Control, T2 = Recommended doses of NPKS (N = 115 kg ha-1, P = 26.40 kg ha-1, K = 62.25 kg ha-1, S = 15 kg ha-1), T3 = Rice straw 1.5 t ha-1 + Cow dung 5 t ha-1, T4 = Rice straw 1.5 t ha-1 + Cow dung 2.5 t ha-1 + 50% less of recommended doses of NPKS, T5 = Rice straw 1.5 t ha-1 + Vermicompost 5 t ha-1 , T6 = Rice straw 1.5 t ha-1 + Vermicompost 2.5 t ha-1 + 50% less of recommended doses of NPKS , T7 = Rice straw 1.5 t ha-1 + Trichocompost 10 t ha-1, T8 = Rice straw 1.5 t ha-1 + Trichocompost 5 t ha-1 + 50% less of recommended doses of NPKS.*

**4. DISCUSSION**

In this experiment, we found that, the residual effect had suppression ability of weed growth and integrated nutrient by manures, fertilizers and residues had the yield enhancement ability which are very much alike to others findings. Huda et al. (2017)found “25 weed species in boro rice fields belonging to 13 families in their experiment at Bangladesh Agricultural University, BAU Farm and farmer’s field in Sutiakhali Notunchar village, Mymensingh. Of them, 21 weed species were found in farmers' fields, whereas 20 weed species were discovered in Agronomy Field Laboratory and BAU Farm. In both Agronomy Field Laboratory and BAU Farm, *Eleocharis atropurpurea* had the highest abundance value, whereas *Cyperus difformis* held the most prominent position in farmers' fields. The remaining prevalent weed species were detected in three different places”. Rahman (2014) found that “eleven weed species from five families infested the experimental plots which were *Scirpus juncoides*, *Monochoria vaginalis, Cyperus difformis, Paspalums crobiculatum*, *Oxalis europaea, Echinochloa crusgalli*, *Nymphaea nouchali, Digitariasanguinalis, Leersiahexandra, Echinochloa colonum* and *Fimbristylis miliacea”*.

At 50 days after transplanting (DAT), the weed density varied significantly between the two rice varieties. The highest weed density was recorded in BRRI dhan49 (V2), while the lowest weed density was observed in BRRI dhan71 (V1). This difference suggests that BRRI dhan71 has a stronger ability to suppress weed growth compared to BRRI dhan49, likely due to differences in growth characteristics such as canopy density, competitive ability, or allelopathic properties. The lower weed density in BRRI dhan71 indicates its superior weed-suppressing potential, making it a more effective choice for minimizing weed competition under the given conditions. According to Gibson & Fischer (2004), weed density could be varied significantly among rice varieties for the growth characteristics such as canopy density, competitive ability.

At 50 days after transplanting (DAT), the dry weight of weeds differed notably between the two rice varieties. The highest dry weight of weeds (g m⁻²) was recorded in BRRI dhan49 (V2), while the lowest dry weight was observed in BRRI dhan71 (V1). This result indicates that BRRI dhan71 was more effective in suppressing weed growth compared to BRRI dhan49. The lower weed dry weight in BRRI dhan71 may be attributed to its superior competitive ability, such as a denser canopy, faster growth, or better resource utilization, which limited the growth and biomass accumulation of weeds. Conversely, the higher weed dry weight in BRRI dhan49 suggests that it provides a less competitive environment for weeds to thrive. Similar result was found by Moukoumbi et al. (2011) who report weed dry weight variation among varieties for varietal characteristics.

At both 25 and 50 days after transplanting (DAT), the weed population showed significant variation across treatments. The highest weed population (weeds per square meter) was observed in T1 in both 25 and 50 DAT, while the lowest was recorded in T6 at both25 and 50 DAT. This indicates that T6 was the most effective treatment in reducing weed infestation at this growth stage, likely due to better weed management practices or enhanced crop competitiveness under this treatment. In contrast, T1 exhibited the highest weed population, suggesting less effective weed control measures or conditions more favorable for weed growth. Similar result was found by Pheng et al. (2010) who reported different crop residues has the weed suppression ability and by them he got less weed infestation in his research plots. The weed dry weight showed significant differences among treatments at both 25 and 50 days after transplanting (DAT). The highest weed dry weight (g m⁻²) was recorded in T1, indicating ineffective weed control or conditions favorable for weed growth under this treatment. Conversely, the lowest weed dry weight was observed in T7, which was statistically similar to the dry weight recorded in T6. At 50 DAT, the highest weed dry weight was recorded in T1, in contrast, the lowest weed dry weight was observed in T6, demonstrating its effectiveness in suppressing weed biomass. This suggests that both T6 and T7 were highly effective in suppressing weed growth during this period. The reduced weed dry weight in T6 suggests the implementation of superior weed management practices, and enhanced crop competitiveness, which limited weed growth. These findings highlight the importance of adopting effective strategies, as seen in T6, to control weeds and reduce their impact on crop productivity. Significant variation of weed dry weight was found by Hossain et al. (2017) among different treatments which were designed by different living plant residues for suppressing weed growth as allelopathy effect on the weeds of rice field.

**5. CONCLUSION**

It was determined from the afore mentioned data that the highest weed population (10.27 no. m-2) and dry weight (19.57 g m-2) for all weed species were found in V2T1 (BRRI dhan49 × Control) combination and the lowest weed population (5.00 no. m-2) and weed dry weight (9.06 g m-2) were obtained from in V1T6 [BRRI dhan71 × (Rice straw 1.5 t ha-1 + Vermicompost 2.5 t ha-1 + 50% less of recommended doses of NPKS)] combination at 50 DAT. According to the experiment it was found that the variety BRRI dhan71 and T6 (Rice straw 1.5 t ha-1 + Vermicompost 2.5 t ha-1 + 50% less of recommended doses of NPKS) exhibited the superior effect by inhibiting weed infestation. So, the results of the present study revealed that combined effect of rice straw with manures and fertilizers demonstrated herbicidal activity for suppressing weed growth. Therefore, rice straw combined with manures and fertilizers could be a potential source of eco-friendly weed management and yield enhancement tool for sustainable crop production by reducing weed infestation.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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