Original Research

Weed suppression and crop performance of T. aman rice in response to combined application of lentil and grasspea crop residues

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ABSTRACT

An experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh from June to November 2018 to investigate the effect of application of lentil and grass pea crop residues on weed management and crop performance of T. aman rice. The experiment consisted of three variety i.e. BR11, BRRI dhan49 and Binadhan-7 and five treatments of crop residues such as no crop residues, lentil crop residue @ 2 t ha⁻¹, grass pea crop residue @ 2 t ha⁻¹, combination of lentil and grass pea @ 1 t ha⁻¹ of each and hand weeding. The experiment was laid out in a randomized complete block design with three replications. The maximum weed growth was noticed with the no crop residues treatment, the minimum was found in hand weeding. The highest percent weed inhibition of 83.95%, 80.87%, 82.21% and 81.49% was obtained from Echinochloa crus-galli, Scirpus juncoides, Monochoria vaginalis and Marsilea quadrifolia L. respectively caused by hand weeding. The grain yield as well as the yield contributing characters produced by BRRI dhan49 was the highest among the studied varieties. The highest production of grain yield was obtained by hand weeding, however, the second highest was obtained from a combination of lentil and grass pea @ 1 t ha⁻¹ of each was applied and the lowest production of grain yield was obtained in T1 (no crop residues). BRRI dhan49 under combination of lentil and grass pea @ 1 t ha⁻¹ of each treatment produced the highest grain yield.

Introduction

Agrarian country Bangladesh enriched with plenty of water as well as suitable climatic condition for rice production. The annual production of rice is 35.30 million metric tons from 11.80 million acres of land (BBS, 2019). Food production in Bangladesh is at far with increase in population growth. Total aman production of financial year 2016-17 has been estimated 13.66 million metric tons compared to 13.02 million metric tons of financial year 2013-14 which is 4.64% higher (BBS,
Sustainable weed management is a challenging task that causes substantial losses worldwide even more than the combined effect of insects, pests and diseases. In Bangladesh, weed infestation reduces the grain yield by 70-80% in *aus* rice, 30-40% for transplanted *aman* rice and 22-36% for modern *boro* rice varieties (Mamun, 1990; BRRI, 2008). Current agriculture is productivity-oriented and depends mostly on artificial inputs to deal with weeds and other pest problem (Sadeghi et al. 2010). Weeds are compromised in all yields as they vie for water, light, other supplements, harbor infections and creepy crawlies. High volumes of weed executioner utilization cause numerous adjustments in plant development like foliar chlorosis, hindrance of development, putrefaction and albinism (Subba et al. 2005). Many herbicides continue in the earth and initiate biomagnifications. So there is an increasing strength for originally produced products worldwide (Jamil et al. 2009). Herbicides planned from the plants will be biodegradable and they are more secure. Allelopathy holds possibilities for particular organic weed administrations. The procedure of allelopathy notices to concoction collaborations inside a wide range of plants. In this procedure the compound discharged or leachates exudates from stems, leaves or foundations of a plant can smoother the advancement of a contiguous one (Scrivanti et al. 2011). Allelopathy is a lifelike phenomenon that takes place both in terrestrial and aquatic natural world (Kulmatiski, 2011) comprehended such interactions with both beneficiary and detrimental multiplicative inverse biochemical mode of action. Allelopathic crops exude diverse and numerous types of allelochemicals with potential to suppress weeds. It helps plants in strengthening their defence system against biotic and abiotic stress and also aids in regulating the nutrients transformations. Allelochemicals from several plants have been identified and their activities have also been established. Plant water extracts have been effective for weed control in several field crops (Cheema et al. 1997; Cheema et al. 2001; Cheema et al. 2002; Wazir et al. 2011). Other allelopathic weed management strategies for weed control in various crops may involve crop mulches (Cheema et al. 2000; Sarker et. al. 2020), soil incorporation of crop residues (Matloob et al. 2010), or the inclusion of crops with allelopathic potential in crop rotations (Einhellig and Rasmussen, 1989). Information regarding crop residues for suppression of weed is very limited in Bangladesh. However, in Bangladesh, so far, a little attempt has been done to exploit the allelopathy of plants for possible weed control purposes in the agriculture sector. In this study, an attempt has been made to examine the optimum dose and the influence of combined application of lentil and grass pea crop residues on weed dynamics, crop growth and yield performance of *T. Aman* rice.
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Materials and Methods

The experiment was carried out at the Agronomy Field Laboratory of Bangladesh Agricultural University, Mymensingh from June to November 2018, located at 24°75' N latitude and 90°50' E longitude at an elevation of 18 m above the mean sea level characterized by non-calcareous dark grey floodplain soil belonging to the Old Brahmaputra Floodplain, (AEZ-9). The soil of the experimental field was more or less neutral in reaction with pH value 6.8, low in organic matter and fertility level. The land type was medium high with silty loam in texture. The experiment consists of two factors including variety (3): i) BRRI dhan49 ii) BR11 iii) Binadhan-7 and crop residues (5): i) No crop residues (control), ii) Lentil crop residues @ 2 t ha⁻¹ iii) Grass pea crop residues @ 2 t ha⁻¹ iv) Combination of lentil and grass pea @ 1 t ha⁻¹ of each and v) Hand weeding in two times. A piece of land was selected for raising seedlings where the sprouted seeds were sown in three different nursery beds on 24th June 2018. After the preparation of the experimental land, uprooted seedlings were immediately transferred to the main field on 28 July 2018 as per treatment specifications. The experiment was laid out in a randomized complete block design with three replications. Thus total numbers of plots were 45. Each plot size was (2.5 m × 2 m). Thirty eight days old seedlings were transplanted in the well prepared field where the rate of three seedlings hill⁻¹ maintaining row and hill distance were 25 cm and 15 cm, respectively. After collection of lentil and grass pea crop, it was dried under shade in the covered threshing floor of Agronomy Field Laboratory of BAU. The studied crop residues were cut as small as possible by using sickle. Lentil and grass pea crop residues were applied at 7 days before transplanting of rice at the time of final land preparation as per experimental specification. After that crop residues were mixed well to the respective plots with a spade to facilitate their decomposition.

Data were collected based on different parameters of rice and weeds. Among them percent inhibition shows the suppressing ability of crop residues on weed.

\[
\text{Inhibition (%) = } \left( \frac{\text{Dry weight of weed at control - Dry weight of weed from treatment}}{\text{Dry weight of weed at control}} \right) \times 100
\]

Data were also collected from rice on yield basis such as grain yield, straw yield, harvest index etc which showed the yield performance of rice. The recorded data were compiled and tabulated for statistical analysis. Analysis of variance was done with the help of computer package, MSTAT-C program. The mean differences among the treatments were adjudged by Duncan's Multiple Range Test at 5 % probability level.
Results and Discussion

Infested weed species in the experimental field

Four weed species belonging to four families infested the experimental field. Local name, scientific name, family, morphological type and life cycle of the weed in the experimental plot have been presented in Table 1. Ahmed et al. (2018) also reported some major weeds infestation in wheat field and their effective suppression by the application of sorghum crop residues.

Table 1. Infested weed species found growing in the experimental plots in rice.

| Sl. No. | Local name    | Scientific name          | Family     | Morphological type | Life cycle |
|---------|---------------|--------------------------|------------|--------------------|------------|
| 1       | Shama         | Echinochloa crusgalli    | Poaceae    | Grass              | Annual     |
| 2       | Chechra       | Scirpus juncoides        | Cyperaceae | Sedge              | Perennial  |
| 3       | Pani kachu    | Monochoria vaginalis     | Pontederiaceae | Broad leaf       | Perennial  |
| 4       | Shusni shak   | Marsilea quadriofilia L. | Marsileaaceae | Broad leaf       | Annual     |

Effect of variety on number and percent inhibition on different weeds

The highest number of weeds was found in V3 and the lowest number was found in V1 variety (Table 2). On the other hand percent inhibition was significantly affected by variety for all weed species. Echinochloa crusgalli, Marsilea quadriofilia L were showed 48.43, 48.81 highest percent inhibition for V1 and Monochoria vaginalis, Scirpus juncoides were found 48.07, 49.18 in V3 variety (Table 2). This results support Pramanik et al. 2019 who showed that the percent inhibition of weed is significantly influenced by variety of transplanted Aman rice and residual effect of marshpepper.

Table 2. Effect of variety on number and percent inhibition on different weeds.

| Weed name | Shama | Shusnishak | Panikachu | Chesra | Shama | Shusnishak | Panikachu | Chesra |
|-----------|-------|------------|-----------|--------|-------|------------|-----------|--------|
| Variety   |       |            |           |        |       |            |           |        |
| V1        | 2.66b | 1.86       | 4.53      | 3.26   | 48.43a| 48.81a     | 47.26b    | 47.25c |
| V2        | 3.46b | 2.60       | 4.66      | 2.86   | 47.87ab| 48.08a     | 48.03a    | 48.37b |
| V3        | 4.40a | 2.60       | 4.20      | 3.60   | 47.44b| 46.49b     | 48.07a    | 49.18a |
| LSD0.05   | 0.89  | 0.94       | 0.79      | 1.19   | 0.71  | 0.75       | 0.63      | 0.60   |
| Level of significance | ** | NS       | NS        | NS    | ** | **         | *         | **     |

Here, 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, NS = Non significant, V1 = BRRI dhan49, V2 = BR11, V3 = Binadhan-7
Effect of crop residues on number and percent inhibition on different weeds

Numbers of weed populations were significantly affected by the treatments for all weed species except *Scirpus juncoides*. Weeds can be suppressed by physical hindrance or by posing chemical (allelopathy) secreted by mulching of crop residues (Khaliq et al. 2015; Reddy, 2001). The lowest weed population was found in T5 treatment (Hand weeding) and the highest was found by T1 treatment (Table 3). The highest percent inhibition was also found in T5 treatment which is followed by T4 treatment where combination of lentil and grass pea crop residues applied at 1tha⁻¹ each. Numerically 63.57, 64.22, 65.56 and 65.96 percent inhibition were found in *Echinochloa crusgalli, Masilea quadrifolia*, *Monochoria vaginalis, Scirpus juncoides* respectively for T4 treatment (Table 3).

| Treatments | Shama | Shusnishak | Panikachu | Chesra | Shama | Shusnishak | Panikachu | Chesra |
|------------|-------|------------|-----------|--------|-------|------------|-----------|--------|
| T1         | 4.66a | 3.22a      | 6.33a     | 4.33   | 0.00e | 0.000e     | 0.000e    | 0.000e |
| T2         | 3.66ab| 2.44abc    | 5.00b     | 3.33   | 41.63d| 44.36d     | 41.34d    | 41.79d |
| T3         | 4.11ab| 2.66ab     | 5.11b     | 3.66   | 52.13c| 51.19c     | 51.18c    | 53.68c |
| T4         | 3.11bc| 2.00bc     | 3.55c     | 2.77   | 63.57b| 64.22b     | 65.56b    | 65.96b |
| T5         | 2.00c | 1.44c      | 2.33d     | 2.11   | 83.95a| 81.49a     | 82.21a    | 80.87a |
| LSD0.05    | 1.16  | 1.22       | 1.02      | 1.54   | 0.92  | 0.97       | 0.81      | 0.79   |

Here, 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, NS = Non significant, T1=No crop residues, T2=Lentil crop residues @ 2.0 t ha⁻¹, T3= Grass pea crop residues @ 2.0 t ha⁻¹, T4=Combination of lentil and grass pea @ 1 t ha⁻¹ of each, T5= Hand weeding.

Combined effect of variety and crop residues on number and percent inhibition on different weeds

The highest percent inhibition for *Echinochloa crusgalli, Masilea quadrifolia*, *Monochoria vaginalis* was also found in the V1T5 combination. For *Scirpus juncoides* V3T5 shows the highest combined effect of variety and crop residues on percent inhibition (Table 4).

Effect of variety on yield and yield contributing characters of rice

Varietal effect on yield and yield contributing characters of rice showed a significant effect. The highest number of total tillers and effective tillers hill⁻¹, panicle length, higher number of grain panicle⁻¹ was found in V1 (BRRI dhan49) variety (Table 5). The highest grain yield (4.62 t ha⁻¹) was
obtained in $V_1$ followed by $V_3$ (4.37 t/ha) (Figure 1). The highest straw yield was found in $V_2$ (Figure 3) but the lowest number of grain yield was found in $V_2$ (3.8) (Figure 1). It was reported that variety significantly differed in respect of grain yield and BR11 showed highest yield of 4.09 t/ha (Hossain et al. 2017).

**Table 4.** Combined effect of variety and crop residues on number and percent inhibition on different weeds.

| Treatments | Weed per quadrats (25×25) cm$^2$ | % Inhibition |
|------------|----------------------------------|--------------|
|            | Shama | Shusnishak | Panikachu | Chesra | Shama | Shusnishak | Panikachu | Chesra |
| $V_1T_1$   | 4.00  | 2.33       | 6.00       | 4.00   | 0.000g | 0.000i     | 0.000g     | 0.000h |
| $V_1T_2$   | 2.33  | 2.00       | 5.00       | 3.33   | 42.27e | 43.35g     | 40.10f     | 40.98g |
| $V_1T_3$   | 3.00  | 2.00       | 5.66       | 3.66   | 52.03d | 51.14f     | 50.68e     | 52.71f |
| $V_1T_4$   | 2.66  | 1.66       | 4.00       | 3.00   | 62.48c | 66.16c     | 62.28d     | 62.54e |
| $V_1T_5$   | 1.33  | 1.33       | 2.00       | 2.33   | 85.40a | 83.42a     | 83.23a     | 80.02b |
| $V_2T_1$   | 4.33  | 4.00       | 6.66       | 4.33   | 0.000g | 0.000i     | 0.000g     | 0.000h |
| $V_2T_2$   | 3.66  | 2.66       | 5.00       | 3.00   | 40.24f | 42.97gh    | 41.12f     | 41.47g |
| $V_2T_3$   | 4.00  | 3.00       | 5.66       | 3.33   | 52.21d | 51.12f     | 51.11e     | 54.02f |
| $V_2T_4$   | 3.33  | 2.00       | 3.33       | 2.33   | 63.90c | 64.37d     | 65.51c     | 65.90d |
| $V_2T_5$   | 2.00  | 1.33       | 2.66       | 1.33   | 83.02b | 81.95a     | 81.43b     | 80.46ab |
| $V_3T_1$   | 5.66  | 3.33       | 6.33       | 4.66   | 0.000g | 0.000i     | 0.000g     | 0.000h |
| $V_3T_2$   | 5.00  | 2.66       | 5.00       | 3.66   | 40.90ef | 41.43h     | 41.44f     | 42.01g |
| $V_3T_3$   | 5.33  | 3.00       | 4.00       | 4.00   | 50.67d | 49.99f     | 50.58e     | 53.59f |
| $V_3T_4$   | 3.33  | 2.33       | 3.33       | 3.00   | 63.16c | 66.89c     | 68.68c     | 68.68c |
| $V_3T_5$   | 2.66  | 1.66       | 2.33       | 2.66   | 82.50b | 80.07b     | 81.43b     | 81.61a |
| LSD$_{0.05}$ | 2.01  | 2.11       | 1.76       | 2.67   | 1.60   | 1.68       | 1.40       | 1.35   |

Here, in a column, figures with the same letter do not differ significantly as per DMRT. ** = Significant at 1% level of probability, NS = Not significant, $V_1$ = BRRI dhan49, $V_2$ = BR11, $V_3$ = Binadhan-7, $T_1$ = No crop residues, $T_2$ = Lentil crop residues @ 2.0 t ha$^{-1}$, $T_3$ = Grass pea crop residues @ 2.0 t ha$^{-1}$, $T_4$ = Combination of lentil and grass pea @ 1 t ha$^{-1}$ of each, $T_5$ = Hand weeding.

**Figure 1.** Grain yield as influenced by variety (Bar represents standard error of means).
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Figure 2. Grain yield as influenced by crop residues (Bar represents standard error of means). Here, $T_1$: No crop residues, $T_2$: Lentil crop residues 2.0 t ha$^{-1}$, $T_3$: Grass pea crop residues 2.0 t ha$^{-1}$, $T_4$: Combination of lentil and grass pea @ 1 t ha$^{-1}$ of each, $T_5$: Hand weeding.

Figure 3. Straw yield as influenced by variety (Bar represents standard error of means).

Table 5. Effect of variety on yield and yield contributing characters of T. aman rice.

| Variety | Plant height (cm) | Total tillers hill$^{-1}$ (no.) | Effective tillers hill$^{-1}$ (no.) | Panicle length (cm) | Grains panicle$^{-1}$ (no.) | 1000-grain weight (g) | Biological yield (t ha$^{-1}$) | Harvest index (%) |
|---------|------------------|---------------------------------|-------------------------------------|---------------------|--------------------------|------------------------|----------------------|------------------|
| $V_1$   | 105.67b          | 10.67a                          | 9.55a                               | 21.92a              | 94.41a                    | 22.56a                 | 10.68a               | 48.22            |
| $V_2$   | 118.81a          | 9.14b                           | 8.10b                               | 20.97b              | 85.41b                    | 21.86b                 | 9.56c                | 48.59            |
| $V_3$   | 102.78c          | 10.53a                          | 9.29a                               | 21.12b              | 84.98b                    | 21.75b                 | 9.91c                | 48.50            |
| LSD$_{0.05}$ | 1.89          | 0.27                            | 0.29                                | 0.73                | 7.98                      | 0.63                   | 0.08                 | 0.54             |

Level of sig. ** ** ** ** * * * ** **

Here, in a column, figures with the same letter(s) or without letter do not differ significantly whereas figures with dissimilar letter differ significantly as per DMRT. $V_1$ = BRRI dhan49, $V_2$ = BR11, $V_3$ = Binadhan-7, ** = Significant at 1% level of probability, * = Significant at 5% level of probability, NS = not significant.

Effect of crop residues on yield and yield contributing characters of rice

Crop residues had also significant effect on yield and yield contributing characters. The highest grain yield (4.99 t ha$^{-1}$) was produced by $T_5$ treatment, followed by $T_4$ (4.68 t ha$^{-1}$) and the lowest
one (3.46 t ha\(^{-1}\)) was produced by T\(_1\) (no residue) treatment due to the production of higher number of effective tillers hill\(^{-1}\) and higher number of grain panicle\(^{-1}\) (Table 6 and Figure 2). Uddin and Pyon (2010) also reported the similar results, where crop residues influenced in crop performance. The highest straw yield (7.15) was found by T\(_5\) followed by T\(_4\) treatment (6.79) (Figure 4).

**Table 6. Effect of crop residues on yield and yield contributing characters of T. aman rice.**

| Crop residues | Plant height (cm) | Total tillers hill\(^{-1}\) (no.) | Effective tillers hill\(^{-1}\) (no.) | Panicle length (cm) | Grains panicle\(^{-1}\) (no.) | 1000-grain weight (g) | Biological yield (t ha\(^{-1}\)) | Harvest index (%) |
|---------------|-------------------|-----------------------------------|-------------------------------------|---------------------|-----------------------------|----------------------|-----------------------|------------------|
| T\(_1\)       | 110.33a           | 8.95d                             | 7.84d                               | 20.64               | 81.68c                      | 21.96ab              | 8.24e                 | 47.93c           |
| T\(_2\)       | 110.29a           | 9.80c                             | 8.63c                               | 21.92               | 83.55bc                     | 22.22ab              | 9.01d                 | 48.75ab          |
| T\(_3\)       | 109.29a           | 9.96c                             | 8.94c                               | 21.54               | 84.48bc                     | 21.48b               | 10.26c                | 49.35a           |
| T\(_4\)       | 106.80b           | 10.49b                            | 9.49b                               | 21.03               | 92.25ab                     | 22.01ab              | 11.08b                | 47.76c           |
| T\(_5\)       | 108.73ab          | 11.35a                            | 10.01a                              | 21.55               | 99.37a                      | 22.62a               | 11.66a                | 48.40bc          |

LSD\(_{0.05}\) 2.44 0.35 0.37 0.94 10.31 0.81 0.10 0.70

Level of sig. ** ** ** NS ** ** ** **

Here, in a column, figures with the same letter(s) or without letter do not differ significantly whereas figures with dissimilar letter differ significantly as per DMRT.** = Significant at 1% level of probability, * = Significant at 5% level of probability, NS = not significant. T\(_1\) = No crop residues, T\(_2\) = Lentil crop residues 2.0 t ha\(^{-1}\), T\(_3\) = Grass pea crop residues 2.0 t ha\(^{-1}\), T\(_4\) = Combination of lentil and grass pea @ 1 t ha\(^{-1}\) of each, T\(_5\) = Hand weeding.

**Figure 4. Straw yield as influenced by crop residues (Bar represents standard error of means).**

Here, T\(_1\) = No crop residues, T\(_2\) = Lentil crop residues 2.0 t ha\(^{-1}\), T\(_3\) = Grass pea crop residues 2.0 t ha\(^{-1}\), T\(_4\) = Combination of lentil and grass pea @ 1 t ha\(^{-1}\) of each, T\(_5\) = Hand weeding.

*Combined effects of variety and crop residues on yield and yield contributing characters of rice*

Yield and yield contributing characters like straw yield and grain yield were significantly affected by the interaction between variety and crop residues. V\(_1\)T\(_5\) combination showed the maximum result (grain and straw yield) followed by V\(_1\)T\(_4\) and the lowest result was produced by
The strong weed suppressing ability of these two combined natural products offers interesting possibilities for effective bio approaches to weed management.

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**Conflicts of Interest**

The authors have declared no conflicts of interest.
References

Afroz F, Uddin M.R, Hasan A.K, Sarker UK, Hoque M.M.I, Islam M.A. 2018. Combined allelopathic effect of buckwheat and marsh pepper crop residues on weed management and crop performance of transplant AMAN rice. Arch Agri Environ Sci. 3(3): 289-296.

Ahmed F, Uddin M.R, Hossain M.D, Sarker U.K, Sarkar D, Chadny D.N. 2018. Effect of aqueous extract of sorghum crop residues on weed management and crop performance of wheat. Bangladesh Agron J. 21(2): 87-95.

BBS. 2018. Year book of Agricultural Statistics of Bangladesh. Bangladesh Bureau of Statistics. Statistical Division, Ministry of Planning. Government of the People’s Republic of Bangladesh, Dhaka 37.

BBS. 2019. Year book of Agricultural Statistics of Bangladesh. Bangladesh Bureau of Statistics. Statistical Division, Ministry of Planning. Government of the People’s Republic of Bangladesh, Dhaka 37.

BRRI. 2008. Annual Report for 2007. Bangladesh Rice Research Institute, Joydevpur, Bangladesh. pp. 28-35.

Cheema Z.A, Luqman M, Khaliq A. 1997. Use of allelopathic extracts of sorghum and sunflower herbage for weed control in wheat. J Anim Plant Sci. 7: 91–93.

Cheema Z.A, Asim M, Khaliq A. 2000. Sorghum allelopathy for weed control in cotton (Gossypium arboreum L.). Int J Agric Biol. 2: 37–41.

Cheema Z.A, Khaliq A, Akhtar S. 2001. Use of sorgaab (Sorghum water extract) as a natural weed inhibitor in spring mungbean. Int J Agric Biol. 3: 515–518.

Cheema Z.A, Iqbal M, Ahmad R. 2002. Response of wheat varieties and some Rabi weeds to allelopathic effects of Sorghum water extract. Int J Agric Biol. 4: 52–55.

Einhellig F.A, Rasmussen J.A. 1989. Prior cropping with grain sorghum inhibits weeds. J Chem Ecol. 15: 951–960.

Jamil M, Cheema Z.A, Mushtaq M.N, Farooq M, Cheema M.A. 2009. Alternative control of wild oat and canary grass in wheat fields by allelopathic plant water extracts. Agron Sustain Dev. 29: 475-482.
Hossain M.N, Uddin M.R, Salam M.A, Sarker U.K, Ferdousi S, Uddin M.J. 2017. Allelopathic potential of mustard crop residues on weed management and crop performance of transplant aman rice. J Bangladesh Agril Univ. 15(2): 133–139.

Khaliq A, Matloob A, Hussain A, Hussain S, Aslam Z.S.J, Chattha M.U. 2015. Wheat residues management options affect productivity, weed growth and soil properties in direct-seeded fine aromatic rice. Clean - Soil Air Water. 43: 1259-1265.

Kulmatiski A. 2011. Changing soils to manage plant communities: activated carbon as a restoration tool in ex-arable fields. Restor Ecol. 19:102-110.

Mamun A.A. 1990. Agro-ecological studies of weeds and weed control in flood prone village of Bangladesh. JSARD (Joint Study on Agriculture and Rural Development) publication Number .17. JICA (Japan International Co-operation Agency). Dhaka, Bangladesh 28- 29, 129, 165.

Matloob A, Khaliq A, Farooq M, Cheema Z.A. 2010. Quantification of allelopathic potential of different crop residues for the purple nutsedge suppression. Pak J Weed Sci Res. 16: 1–12.

Pramanik S.K, Uddin M.R, Sarker U.K, Sarkar D, Ahmed F, Alam M.J. 2019. Allelopathic potential of marsh pepper residues for weed management and yield of transplant Aman rice. Prog. Agric. 30(4): 379-386.

Reddy K.N. 2001. Effect of cereal and legume cover crop residues on weeds, yield and net return in soybean (Glycine max L.). Weed Res. 25:415-421.

Sadeghi S, Rahnavard A, Ashrafi Z.Y. 2010. Response of wheat (Triticum aestivum) germination and growth of seedling to allelopathic potential of sunflower (Helianthus annuus) and barley (Hordeum vulgare L.) extracts. J Ag Tech. 6 573-577.

Sarker U.K, Uddin M.R, Faruk G.M. 2020. Weed suppressing ability and performance of common crop residues for sustainable weed management. J Res Weed Sci. 3(3):310-327.

Scrivanti L, Anton A, Zygadlo J.A. 2011. Allelopathic potential of South American Bothriochloa species (Poaceae: Andropogoneae). Allelopathy J. 28:189-200.

Subba R.I, Madhulety T. 2005. Role of herbicides in improving crop yields. Developments in physiology biochemistry and molecular biology of Plants, Bose, B. and Hemantaranjan, A.(Eds.) New India. Publishing Agency, New Delhi 1:203-287.
Uddin M.R, Pyon J.Y. 2010. Herbicidal activity of rotation crop residues on weeds and selectivity to crops. J Agric Sci. 37(1) 1-6.

Wazir I, Sadiq M, Baloch M.S, Awan I.U, Khan E.A, Shah I.H, Nadim M.A, Khakwani A.A, Bakhsh I. 2011. Application of bio-herbicide alternatives for chemical weed control in rice. Pak J Weed Sci Res. 17: 245–252.

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