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Weed Management in Mustard (*Brassica napus* L.) under Minimum Tillage and Crop Residues

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Introduction

Weed management is critical to obtaining profitable yields in minimum tillage system. Innovative weed control strategies including chemical methods will continue to be an essential component in the development of sustainable conservation agriculture (CA) practices (Andrew and Kelton, 2011). Weed management in minimum tillage relied on extensive use of herbicides. This may leads to the development of resistance in weeds. Crop residue can decrease density and dry weight of perennial weeds by 35 and 75%, respectively, and of annual weeds around 80% compared to no residue (Fisk et al., 2001). Wheat (*Triticum aestivum* L.) residue can reduce weed seedling emergence in corn by 45% (Crutchfield et al., 1986) and weed biomass in sorghum (*Sorghum bicolor* L.) by 60% (Wicks et al., 1994). These results suggest that, residue retention can be a promising method providing a sustainable approach for suppressing weeds in conservation tillage. Therefore, a study was undertaken to examine, weeds management and yield performance of mustard under minimum tillage and different levels of residue retention.

Materials and Methods

An on-farm research was conducted at the Vangnamari union under Gouripur upazila of Mymensingh district of Bangladesh during 13 November 2013 to 4 February 2014. In this experiment a mustard CV. *BARI sharisha-14*, was sown with 6 tillage and weed control practices *viz*., **W_1**: Conventional tillage + one weeding (Control); **W_2:** Roundup (RU) + Strip tillage (ST); **W_3:** RU+ ST + Pre-emergence (PE) herbicide (Pendimethalin); **W_4:** RU+ ST + Post-emergence (PO) herbicide (Oxadiazon); **W_5:** RU+ ST + PE + PO; **W_6:** RU+ ST + weed-free, and 2 levels of crop residue *viz*., **Cr_1:** Current residue (20%) and **Cr_2:** Increased residue (50%). The design was randomized complete block design with 4 replications consisting 48 (6×2×4) plots of 9 m × 5 m each. Weed samples were taken randomly from four locations of 0.25 m^2 at 35 days after sowing (DAS). Weed populations were counted species wise and then oven dried at 70^0C for 72 hours. The crop was harvested from three locations of 3 m^2 areas and grain yield was recorded. Data were subjected to analysis of variance using MSTAT-C and means were separated by Duncan's Multiple Range Test.

Results and Discussions

Weed infestation

The experimental plots were infested with 24 weed species belonging to 13 families, of which 18 were annuals and 6 perennials (Table 1). Of these weed species, 6 belonged to Poaceae 3 to Cyperaceae, 2 to each of Amaranthaceae, Asteraceae, Brassicaceae, Fabaceae and each one of rest of the 7 families.

Tillage and weed control effect on weed and crop

The highest weed density (40 m^{-2}) and dry matter (29 g m^{-2}) was found in control (W_1) while both were nil in strip tilled (ST) weed free plots (W_6). However, the lowest weed density (12 m^{-2}) and dry matter (6 gm^{-2}) was recorded in ST followed by RU, PE and PO (W_5) (Fig. 1). W_1 yielded the lowest (0.58 tha^{-1}) and the highest (0.95 tha^{-1}) was recorded from W_6 while the second highest (0.90 tha^{-1}) from W_5 (Figure 2). The highest BCR (2.29) was calculated from W_5 in contrast to W_6 (2.13) (Fig. 2).

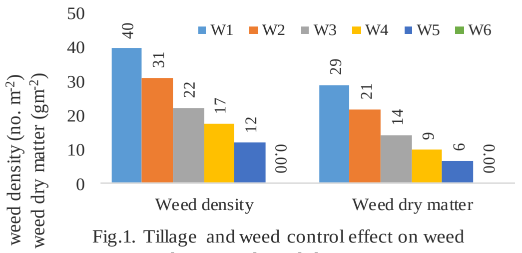

Fig.1. Tillage and weed control effect on weed density and weed dry matter

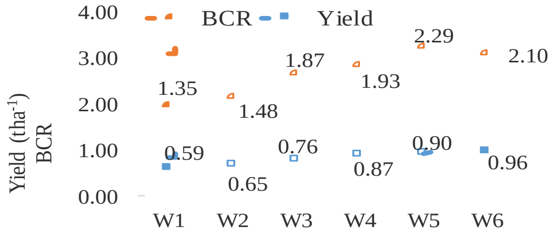

Fig.2. Tillage and weed control effect on Yield and BCR

Effect of crop residue on weed and mustard

Figure 3 shows that, at low crop residues, weed density and weed dry matter were high but crop yield was low. In contrast, weed density and weed dry matter was low and crop yield was high at high crop residue. These results suggest that, increased residue might have reduced weed emergence and increased crop yield by 52%.

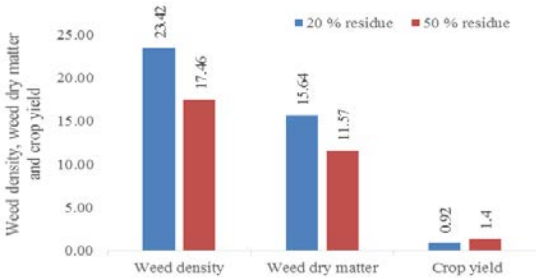

Fig. 3. Effect of crop residue on weed and mustard

Table 1: Weed infestation in the experiment plots (*annual species, ** perennial species)

Species	Family	Density	Species	Family	Density
Alternanthera sessilis *	Amaranthaceae	**300**	*Vicia sativa* *	Fabaceae	8
A. philoxeroides *	Amaranthaceae	26	*Desmodium triflorum* **	Fabaceae	2
Centipeda minima **	Asteraceae	14	*Marsilea quadrifolia**	Marsiliaceae	15
Eclipta alba *	Asteraceae	**198**	*Jussiaea decurrens* *	Onagraceae	10
*Heliotropium indicum**	Boraginaceae	16	*Echinochloa crusgalli* *	Poaceae	**99**
Brassica kaber *	Brassicaceae	14	*E. colonum* *	Poaceae	29
Raphanus raphanistrum *	Brassicaceae	6	*Digitaria sanguinalis* *	Poaceae	5
*Spilanthes acmella**	Campanulaceae	14	*Cynodon dactylon* **	Poaceae	9
Chenopodium album *	Chenopodiaceae	10	*Leersia hexandra* **	Poaceae	4
Cyperus rotundus **	Cyperaceae	4	*Panicum repens* **	Poaceae	6
Cyperus difformis *	Cyperaceae	2	*Polygonum coccineum* *	Polygonaceae	**46**
Fimbristylis miliaceae *	Cyperaceae	20	*Lindernia procumbens* *	Scrophulariaceae	**38**

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