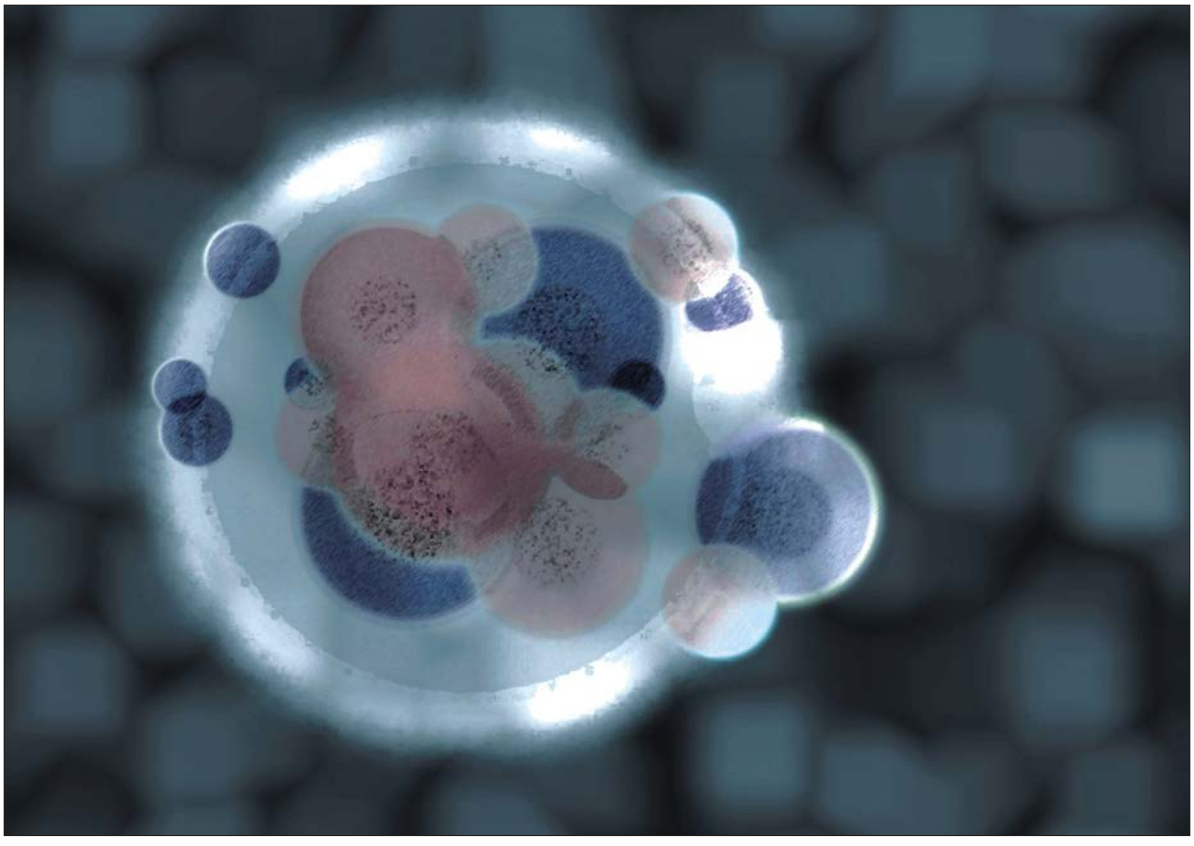

Journal of Biological Sciences

ISSN 1727-3048

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Journal of Biological Sciences 6 (6): 992-998, 2006
ISSN 1727-3048

Performance of Wheat Cultivars as Understory Crop of Multipurpose Trees in Taungya System

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Abstract: A field experiment was conducted to evaluate the performance of wheat varieties as an understory crop of different multipurpose tree species at the Agroforestry Farm, Hajee Mohammad Danesh Science and Technology University, Dinajpur, during November 2005 to March 2006. Five wheat varieties such as Gourove, Sourove, Shotabdi, Kanchan and Protiva were cultivated as an understorey crop of three different tree species such as *Albizia lebbeck*, *Psidium guajava* and *Mangifera indica*. The experiment was laid out in split plot design with three replications where tree species were in main plot and wheat varieties were in sub plots. All the tree species were statistically indifferent in their effect on grain yield. However, the highest yield (2.60 t ha^{-1}) was found under *Albizia lebbeck* followed by *Mangifera indica* (2.58 t ha^{-1}) and *Psidium guajava* (2.53 t ha^{-1}). The trees species at their early stages of growth had a very little impact on the associated wheat crop except that crops grown in close proximity with tree lines suffered around 11-13% yield reduction. Among the wheat varieties, Shotabdi produced the highest grain yield (2.88 t ha^{-1}) and total dry matter followed by Gourove and Shourove. Therefore, it can be suggested that farmers in the northern region of Bangladesh may cultivate wheat variety Shotabdi as an understory crop of *Albizia lebbeck* during its early years of establishment.

Key words: Multipurpose trees, taungya system, wheat cultivars

INTRODUCTION

Bangladesh is one of the most densely populated countries of the world having an agro based economy. Bangladesh is situated in the North-Eastern part of South Asia with a tropical to sub-tropical climate. Wheat (*Triticum aestivum*) is one of the major food crops of the world and is the second important cereal crop of Bangladesh after rice. The average yield of wheat in Bangladesh is 1.9 ton ha^{-1} which is very low compared to other wheat growing countries (BARI, 1990). Farmers in our country practice monoculture of wheat. But practicing agroforestry system with suitable tree-crop association may increase total production than that of monoculture.

Taungya is an agroforestry system practiced in the tropics. The word is reported to have originated in Myanmar. The taungya system consists of growing annual agricultural crops along with the forestry species during the early years of establishment of the forestry plantation (Nair, 1993). In Agroforestry system interaction between trees and crops has mainly been focused since sharing of the common resources by different species is the common phenomenon (Torquaebian, 1994). Intercropping of trees with arable crops resulted in an increase in biomass production per unit area as reported by Ong (1991). He also reported that biomass production could be increased substantially when the roots of trees exploit water and nutrients below the shallow roots of crops and when a mixed canopy intercepts more solar energy. Wheat yield in agroforestry systems under irrigated conditions were studied by several scientists. Different tree species had different effect on growth and yield parameters of wheat. Grain yield, dry matter yield, leaf area index, spikelets m^{-1} and grain spike^{-1} of wheat cultivars were reduced under *Sissoo* (*Dalbergia sissoo*) tree canopies compared to crops growing in the open place (Ravi *et al*., 2001; Nandal *et al.*, 1999). Satish *et al*. (2003) reported that wheat grain yield decreased significantly with the increase in shade duration due to *Eucalyptus* plantation on eastern side of the wheat field. The influence of *Acacia nilotica* on the growth and yield of associated wheat crop under irrigated condition were reported by Sharma (1992), Khan and Ehrenreich (1994) and Puri and Bangarwa (1993). Puri and Bangarwa (1993) found that *Azadirachta indica* and *Prosopis cineraria* did not make any significant

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difference to wheat yield. While *Acacia nilotica* reduced yield by 4-30%, but reduction was only up to a distance of 3 m. Khan and Ehrenreich (1994) found that close proximity to trees adversely affected tillers m^{-2}, grains $spike^{-1}$ or 1000 grain weight, but grain yield were slightly lower near the largest trees. Khan and Aslam (1974) studied the effect of single sissoo (*Dalbergia sissoo*) tree on the yield of wheat crop and reported that the grain yield showed a decrease of 30.88, 23.6 and 12.7% at the distance of 3, 4.3 and 6 m, respectively as compared to the open field. Roy *et al*. (2005) reported that the highest grain (3.27 t ha^{-1}) and straw (3.82 t ha^{-1}) yield was obtained from plots with *Melia azadarach* and the lowest grain (2.57 t ha^{-1}) and straw (2.87 t ha^{-1}) yield was obtained from the plot with *Albizia lebbeck*.

The northern region of Bangladesh has the suitable climate to cultivate wheat commercially. Wheat is traditionally grown in association with different trees by the farmers of that region. On the other hand many modern wheat varieties have been released by Wheat Research Centre (WRC), BARI in Bangladesh, which have high yielding capacity, disease resistant, and heat tolerance. So the performance of wheat verities grown along with different forest and fruit trees during their early years of establishment needs to be examined. Keeping this view in mind the present piece of research was undertaken to assess the yield performance of wheat in association with multipurpose trees like *Albizia lebbeck*, *Psidium guajava* and *Mangifera indica* and to identify the appropriate wheat variety for growing in partial shade of trees.

MATERIALS AND METHODS

The site of the experiment is situated between 25°13' Latitude and 88°23' longitude at the elevation of 37 m above the sea level. The experiment was conducted at the Agroforestry Farm, Department of Agroforestry, Hajee Mohammmad Danesh Science and Technology University, during November 2005 to March 2006. The experiment was laid out in a medium high land with sandy loam texture heaving pH 5.1.

Climate and weather: The climate of the study area is characterized by plenty of rainfall during kharif season (April to September) and scanty rainfall during rabi season (October to March). The mean of maximum temperature in summer (April to September) was 23°C and the mean of minimum temperature in winter (October to March) was 14.9°C. The mean humidity during kharif and rabi was 83.33% and 77%, respectively.

Experimental design and treatment combination: The experiment was laid out following a split plot design with two factorial arrangements. Two factors involved in the study were three tree species; *Mangifera indica*, *Psidium guajava* and *Albizia lebbeck* in main plots and five wheat verities; Gourove, shourove, Shotabdi, Kanchan and Protiva in sub plots. Total number of experimental plots was 60. The size of each unit plot was 2.5×2.5 m. Forty five plots were laid under the tree canopy and 15 plots were laid away from the tree canopy (control).

Land preparation: The experimental field was opened with a power tiller on 4 November, 2005. Thereafter the land was spaded and laddering was done several times to obtain good tilth. All the weeds and rubbles were removed from the field and then left exposed to natural condition for several days before the land was finally ready for seed sowing.

Fertilizer application: According to Razzaque *et al*. (2000) urea, triple super phosphate, muriate of potash and gypsum were applied in the field at the rate of 180, 140, 40 and 110 kg ha^{-1}, respectively. Cowdung was applied at the rate of 7 t ha^{-1}. One third of urea and entire amount of other fertilizers and manures were applied as basal dose at the time of final land preparation. The individual plots were spaded and fertilizers were incorporated before sowing. The remaining two-third of urea was top dressed in two equal splits at early tillering and late tillering stages.

Experimental materials: The crop species wheat (*Triticum aestivum* L.) was used in this study. Five wheat varieties i.e., Gourove, Shourove, Shotabdi, Kanchan and Protiva were used as experimental crops. The tree species had the following average height, basal area and canopy diameter during the study period.

Tree species	Average height (m)	Basal diameter (cm)	Canopy diameter (cm)
Albizia lebbeck	3.05	5.01	100.0
Psidium guajava	1.75	3.92	112.5
Mangifera indica	1.48	5.06	102.6

Sowing of seeds: Seeds were sown on 15 November 2005 at the rate of 120 kg seeds ha^{-1}. Seeds were sown continuously in lines and were covered by soil. The lines were 20 cm apart, making 12 rows per plot.

Intercultural operation: Intercultural operations such as weeding, thinning and irrigation were given uniformly in each plot. Weeding was done two times at 20 and 50 Days

After Sowing (DAS). At the time of first weeding, thinning was done to maintain 5 cm distance from plant to plant. The field was irrigated after each weeding. Plant protection measures were not required.

Harvesting and data recording: The crop was harvested on March 15, 2006. The grain and straw were separated by hand threshing. For collecting data on several plant characters, 5 randomly selected plants were uprooted from each plot before harvesting. The harvested crops were then threshed and grain yield was recorded plot-wise on 14% moisture basis as ton/ha. Except the grain yield, all dry weights were taken on an oven dry basis.

Statistical analysis: Data were statistically analyzed using the analysis of variance (ANOVA) technique and the mean differences were calculated by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

RESULTS

Plant height (cm): Plant height of wheat was significantly different when grown under different tree species. The highest plant height (94.14 cm) was obtained from the plots away from the tree canopy i.e., open field and the lowest plant height was obtained under *Psidium guajava* trees. *Albizia lebbeck* and *Mangifera indica* were statistically similar to control in their effect on plant height (Table 1). The varietal and interaction effect was not statistically significant on plant height (Table 2 and 3a).

Stem height (cm): The stem height of the wheat was significantly affected by trees. Except *Psidium guajava* all the tree species produced the statistically similar stem height. The lowest stem height was found (80.12 cm) under *Psidium guajava* (Table 1). Wheat varieties did not differ statistically on stem height. The highest stem height (83.22 cm) was found in Shotabdi and the lowest was in Protiva (Table 2). There was no significant difference on stem height of the wheat varieties growing under the trees and away from the tree canopy. The highest stem height was found (85.20 cm) of V_3 (Shotabdi) under open field. The lowest stem height was found (78.40 cm) from Protiva grown under *Psidium guajava* (Table 3a).

Number of spikes hill^{-1}: The number of spikes hill^{-1} of wheat was not significantly affected by the trees (Table 1). The number of spikes hill^{-1} was significantly influenced by the varieties. Except Shourove all the varieties produced statistically similar number of spikes hill^{-1} (Table 2). Interaction showed no significant variation in number of spikes hill^{-1} (Table 3a).

Length of spike hill^{-1} (cm): The length of spike hill^{-1} was not significantly affected by the tree species. The highest length (10.35 cm) was found away from the tree canopy and the lowest (9.78 cm) under *Mangifera indica*. The length of spikes hill^{-1} was significantly affected by the varieties. The lowest spike length was found (9.60 cm) from Protiva which was statistically similar to Kanchan. The highest spike length (10.60 cm) was found from. Shotabdi which was statically similar to Gourove. The interaction effect of trees and wheat varieties was not significant on spike length hill^{-1} (Table 3a).

Number of grain hill^{-1}: The number of total grain hill^{-1} was significantly affected by the tree species. The highest

Table 1: Effect of trees species on the yield and yield contributing characters of wheat

Treatments	Plant height (cm)	Stem height (cm)	No. of spike hill^{-1}	Length of spike hill^{-1} (cm)	No. of grain hill^{-1}	Grain wt. (g hill^{-1})	Stem dry weight (g)	Leaf dry weight (g)	Grain yield (t ha^{-1})	Root dry weight (g)	Total dry matter (g)
Control	94.14a	83.82a	3.34	10.35	124.62a	4.32a	3.59a	1.84a	2.92a	2.87a	8.20a
Albizia lebbeck	93.12ab	83.08a	3.30	10.17	111.43b	4.04b	3.30ab	1.84a	2.60b	2.31b	7.11b
Psidium guajava	90.67b	80.12b	3.21	10.00	108.01c	4.03b	2.98b	1.51c	2.53b	2.16b	6.68c
Mangifera indica	92.18ab	81.56ab	3.24	9.78	110.99b	4.7b	3.25ab	1.52c	2.58b	2.11b	7.04b
Level of significance	*	*	NS	NS	**	**	*	**	**	**	**

In column, figure having the similar letter(s) or without letter(s) do not differ significantly as per DMRT, NS = Not Significant, ** = Significant at 1% level of probability, * = Significant at 5% level of probability

Table 2: Varietal effect on the yield and yield contributing characters of wheat

Treatments	Plant height (cm)	Stem height (cm)	No. of spike hill^{-1}	Length of spike hill^{-1} (cm)	No. of grain hill^{-1}	Grain wt. (g hill^{-1})	Stem dry weight (g)	Leaf dry weight (g)	Grain yield (t ha^{-1})	Root dry weight (g)	Total dry matter (g)
Gourove	93.47	82.85	3.29ab	10.35a	113.30b	4.46b	3.19b	1.69a	2.76ab	2.86b	7.80b
Shourove	92.12	81.82	3.04b	10.02b	115.19b	3.38c	3.12b	1.69a	2.67b	2.46c	7.24c
Shotabdi	93.50	83.22	3.47a	10.60a	125.86a	4.788a	3.57a	1.76a	2.88a	2.96a	8.18a
Kanchan	92.32	81.62	3.27ab	9.64c	111.20b	3.76cb	3.46a	1.43b	2.53c	2.25d	7.17c
Protiva	91.22	81.20	3.28ab	9.60c	103.25c	3.61d	3.05b	1.44b	2.44c	1.46e	5.90d
Level of significance	NS	NS	*	**	**	**	**	**	**	**	**

Footnote as in Table 1

Table 3a: Interaction effect on the yield and yield contribution characters of wheat

Treatments	Plant height (cm)	Stem height (cm)	No. of spike hill^{-1}	Length of spike hill^{-1} (cm)	No. of grain hill^{-1}	Grain wt. (g hill^{-1})	Grain yield (t ha^{-1})
T_1V_1	94.60	84.40	3.20	10.90	125.23bc	4.80	3.04
T_1V_2	93.60	84.20	3.30	10.70	128.20b	4.03	2.96
T_1V_3	95.20	85.20	3.60	11.20	139.16a	4.95	3.16
T_1V_4	93.20	82.10	3.50	9.70	120.33b-e	3.95	2.80
T_1V_5	94.10	83.20	3.10	9.80	110.20f-i	3.88	2.64
T_2V_1	93.60	82.40	3.30	10.60	112.20e-h	4.60	2.72
T_2V_2	89.20	79.80	3.00	10.40	115.60d-g	3.80	2.56
T_2V_3	94.20	83.20	3.40	10.40	122.20b-d	4.88	2.88
T_2V_4	91.80	80.10	3.30	9.50	108.50g-i	3.90	2.48
T_2V_5	93.10	82.30	3.20	9.60	98.16j	3.41	2.38
T_3V_1	92.40	81.40	3.10	10.80	102.16ij	4.40	2.64
T_3V_2	89.40	79.20	3.06	10.35	98.33j	4.01	2.56
T_3V_3	92.20	81.40	3.50	10.42	122.20b-d	4.50	2.70
T_3V_4	90.28	80.20	3.20	9.70	107.20g-i	3.40	2.40
T_3V_5	89.10	78.40	3.60	9.46	98.16j	3.68	2.37
T_4V_1	93.30	83.20	3.50	10.20	105.60h-j	4.06	2.65
T_4V_2	92.70	82.40	2.80	9.50	118.66c-f	4.02	2.60
T_4V_3	93.40	83.10	3.40	10.30	121.61b-d	4.80	2.80
T_4V_4	93.20	84.10	3.10	9.50	108.80g-i	3.80	2.47
T_4V_5	92.20	82.60	3.25	9.50	102.50ij	3.50	2.40
Level of Significance	NS	NS	NS	NS	**	NS	NS

In column, figure having the similar letter(s) or without letter(s) do not differ significantly as per DMRT. NS = Not Significant, T_1 = Control (open field), T_2 = *Albizia lebbeck*, T_3 = *Psidium guajava*, T_4 = *Mangifera indica*, V_1 = Gourove, V_2 = Shourove V_3 = Shotabdi, V_4 = Kanchan,V_5 = Protiva,** = Significant at 1% level of probability, * = Significant at 5% level of probability

number of grain hill^{-1} was produced (124.62) in the open field and the lowest grain hill^{-1} was produced (108.01) under *Psidium guajava* tree. *Mangifera indica* produced statistically similar number of grain per hill to that of *Albizia lebbeck* (Table 1). Total number of grain hill^{-1} was also significantly influenced by the varieties. The highest number of grain (125.86) was obtained from Shotabdi and the lowest was (103.25) from Protiva. Gourove, Shourove and Kanchan produced statistically similar number of grain hill^{-1} (Table 2). Interaction effect on number of grain hill^{-1} was also significant. The highest number of grain hill^{-1} (139.16) was obtained from Shotabdi in the open field or control while the lowest number (98.16) was from Protiva under *Psidium guajava* (Table 3a).

Total grain weight hill^{-1} (g): Total grain weight hill^{-1} was significantly influenced by the tree species. The highest grain weight hill^{-1} (4.32 g) was found in control. *Albizia lebbeck*, *Psidium guajava* and *Mangifera indica* were statistically identical in their effect on grain weight hill^{-1} (Table 1). Total grain weight hill^{-1} was also significantly influenced by the varieties. Shotabdi produced the maximum grain weight (4.78 g) and Shourove produced the second highest which was statically similar to Kanchan. The lowest grain weight (3.61 g) was produced by Protiva (Table 2). Interaction effect on total grain weight hill^{-1} was not significant (Table 3a).

Grain yield (t ha^{-1}): Grain yield was significantly influenced by the tree species. The highest grain yield (2.92 t ha^{-1}) was produced in open field and the lowest yield (2.53 t ha^{-1}) was found under *Psidium guajava*. All the tree species produced statistically similar yield as compared to the open field (Table 1). Grain yield (t ha^{-1}) was also significantly affected by the varieties. Shotabdi produced the maximum grain yield (2.88 t ha^{-1}) which was statistically identical with Gourove and the lowest grain yield (2.44 t ha^{-1}) was produced by Protiva which was statistically identical with Kanchan. The 3rd highest yield was produced (2.67 t ha^{-1}) by Shourove (Table 3). However, interaction effect was not significant on grain yield. The highest grain yield (3.16 t ha^{-1}) was produced by Shotabdi in the open field and the lowest yield (2.37 t ha^{-1}) was produced by Protiva under *Psidium guajava* (Table 3a).

Stem dry weight hill^{-1} (g): Stem dry weight hill^{-1} was significantly affected by the trees. *Albizia lebbeck* and *Mangifera indica* produced stem weight statistically similar to that of open field (Table 1). The stem dry weight was found significantly affected by the varieties also. The highest stem dry weight was produced by Shotabdi followed by Kanchan. Gourove, Shourove and Protiva were statistically similar in their effect on stem dry weight (Table 2). The stem dry weight hill^{-1} was significantly affected by the interaction of tree species and wheat varieties. The highest stem dry weight were produced (3.80 g) by Shotabdi in open field and the lowest was found (2.60 g) with Protiva under *Psidium guajava* (Table 3b).

Table 3b: Interaction effect on stem dry weight, leaf dry weight, root dry weight and total dry matter yield of wheat

Treatments	Stem dry wt. (g)	Leaf dry wt. (g)	Root dry weight (g)	Total dry matter (g)
T_1V_1	3.46	1.95a	3.25b	8.69b
T_1V_2	3.20	1.90ab	3.10bc	8.25bc
T_1V_3	3.80	1.98a	3.56a	9.29a
T_1V_4	3.71	1.80a-c	2.56d	8.01cd
T_1V_5	3.78	1.60cd	1.90i	6.80g-i
T_2V_1	3.04	1.71a-c	2.50de	7.15f-i
T_2V_2	3.13	1.75a-c	2.23e-g	6.68hi
T_2V_3	3.32	1.80a-c	2.46de	7.50d-f
T_2V_4	3.10	1.62b-d	2.00hi	6.53i
T_2V_5	2.86	1.20e	1.40j	5.46j
T_3V_1	3.16	1.80a-c	3.01bc	7.96c-e
T_3V_2	3.21	1.40de	2.10g-i	6.70hi
T_3V_3	3.41	1.90ab	2.95c	8.26bc
T_3V_4	3.60	1.30e	2.30d-g	7.20f-i
T_3V_5	2.60	1.18e	1.20j	5.45j
T_4V_1	3.12	1.30e	3.10bc	7.42d-g
T_4V_2	3.21	1.71a-c	2.41d-f	7.34e-h
T_4V_3	3.80	1.42bc	2.31d-g	7.6d-f
T_4V_4	3.40	1.43de	2.15f-i	6.95f-i
T_4V_5	2.70	1.78a-c	1.35j	6.91j
Level of Significance	NS	**	**	**

Footnote as Table 3a

Leaf dry weight hill^{-1}: The variation in leaf dry weight was significantly affected by trees. The highest leaf dry weight was produced (1.84 g) under open field which was statically similar to *Albizia lebbeck*. The lowest leaf dry weight (1.51 g) was found under *Psidium guajava* which was statistically similar to *Mangifera indica* (Table 1). The leaf dry weight hill^{-1} was significantly influenced by the wheat varieties. The highest leaf dry weight was found (1.76 g) by Shotabdi which was statistically identical with Shourove and Gourove. The lowest leaf dry weight was found (1.43 g) from Kanchan (Table 2). The leaf dry weight of wheat was significantly affected by the interaction of trees and varieties. The maximum leaf dry weight was produced (1.98 g) by Shotabdi in open field and the minimum leaf dry weight was found (1.18 g) in Protiva under *Psidium guajava* (Table 3b).

Root dry weight: Root dry weight of wheat varieties was significantly affected by the trees. The highest root dry weight was produced (92.87 g) at open field and the lowest root dry weight were found (2.11 g) under *Mangifera indica*. All the tree species showed statistically similar amount of root dry weight (Table 1). Root dry weight of different wheat varieties was significantly affected. The highest root dry weight was found (2.96 g) from Shotabdi followed by Gourove, Shourove and Kanchan. The lowest root dry weight was produced (1.46 g) by Protiva (Table 2). The interaction of trees and wheat varieties were significantly varied. The maximum root dry matter was produced (3.56 g) by Shotabdi in open field. The minimum root dry matter (1.20 g) was found in Protiva under *Psidium guajava* (Table 3b).

Total Dry Matter (TDM): Total Dry Matter (TDM) was significantly influence by the tree species. The highest total dry matter hill^{-1} was produced (8.20 g) in open field and the lowest TDM hill^{-1} was found (6.68 g) under *Psidium guajava*. *Albizia lebbeck* and *Mangifera indica* gave statistically similar dry matter yield (Table 1). The total dry matter hill^{-1} was also significantly influenced by the wheat varieties. The highest total dry matter hill^{-1} (8.18 g) was produced by Shotabdi followed by Gourove, and Shourove. The lowest TDM (5.90 g) was produced by Protiva (Table 2). The interaction effect of trees and wheat varieties on total dry matter yield hill^{-1} was also significant. The highest TDM was produced (2 g) by Shotabdi in open field and the lowest was found (5.45 g) of Protiva under *Psidium guajava* (Table 3b).

DISCUSSION

All the tree species were statistically indifferent in their effect on grain yield. Crop yield was reduced under the *Albizia lebbeck, Mangifera indica* and *Psidium guajava* tree canopy by 11, 12 and 13% of the open field, respectively.

Among the wheat varieties, Shotabdi produced the highest grain yield (2.88 t ha^{-1}) and total dry matter followed by Gourove and Shourove. Kanchan and Protiva

showed the low yield potential among the varieties. Shotabdi under *Albizia lebbeck* gave the highest yield among the varieties. Protiva under *Psidium guajava* resulted in a low yield potential among the varieties. The result in the present study is in agreement with the findings of Akber *et al.* (1990), Sharma (1992), Khan and Ehrenreich (1994) and Nandal *et al.* (1999). Akber *et al.* (1990) reported that wheat yield under different tree species (Eucalyptus, Mulberry, Siris, Ipil-ipil) did not show any significant difference as compared to control yield. Nandal *et al.* (1999) investigated the performance of 5 wheat cultivars under sissoo trees. Grain yield, dry matter yield, leaf area index, spikelets m^{-1} and grains $spike^{-1}$ were reduced under tree canopy compared to crops growing in the open field (Ibid). Khan and Ehrenreich (1994) reported that close proximity to trees adversely affected tillers m^{-2}, grains $spike^{-1}$ or 1000 grain weight, but grain yield were slightly lowest near largest trees. Sharma (1992) observed that the tree line did negatively affect all crop parameters like yield in the vicinity of trees and established that as the distance from the tree line increased the growth and yield of wheat also increased. The result in the present study contradicts with the findings of Roy *et al.* (2005). They reported that grain and straw yields of wheat were significantly influenced by tree species. The highest grain (3.27 t ha^{-1}) and straw (3.82 t ha^{-1}) yield was obtained from plots with *Melia azadarach* and the lowest grain (2.57 t ha^{-1}) and straw (2.87 t ha^{-1}) yield was obtained from the plot with *Albizia lebbeck*. In this study, all the tree species were statistically indifferent in their effect on grain yield and highest grain yield was obtained from the plots with *Albizia lebbeck*. This was because all the tree species used in the present study are still in the early age of establishment. The average height of the tree species is not more than 3 m having a canopy diameter around 100 cm. So, the tree species had a very little impact on the associated wheat crop except that crops grown in close proximity with tree lines suffered around 11-13% yield reduction. It is very likely that crop suffers yield reduction in the vicinity of tree species due to below ground competition for nutrients and water. *Albizia lebbeck* is a deciduous nitrogen fixing tree. So, it might have a positive effect on associated wheat than the other tree species had.

So the results indicated that cultivation of wheat crop in association with tree species in their early years of establishment is possible without having significant loss in the yield. Wheat variety Shotabdi as an understory crop of deciduous nitrogen fixing tree like *Albizia lebbeck* can be suggested to practice for the farmers in the northern part of Bangladesh.

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