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Effect of Relative Time of *Cyperus rotundus* Emergence on Fibre Yield and Competitive Ability of Olitorius Jute

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Abstract: The competitive ability of jute was measured as aggressivity. About 31% fibre yield was reduced due to the competition from the weed when grown together with jute irrespective of time of jute sowing. When the weeds emerged 10 days earlier than the crop, the yield was reduced by 37% and it was reduced by 16% when the weeds emerged 10 days later. The effect on total dry matter of jute was also more or less similar to fibre yield. The weed produced 2.73kg/m² of total dry matter (above ground + below-ground parts) in early-sown and 2.17kg/m² in late sown conditions irrespective of time of jute sowing. Weed dry matter was reduced by 35% due to competition with jute. The crop was most aggressive when it was grown early with late-sown weed and was least aggressive when grown as late-emerged crop with early-emerged weeds. The aggressivity of jute was 18% less when the weeds emerged 10 days earlier than early-sown jute and 35% less than late-sown jute. It increased by about 66% when the weeds emerged 10 days later than early-sown jute and by 47% than late-sown jute.

Key words: Weed emergence, *Cyperus rotundus*, olitorius jute, aggressivity, fibre yield

Introduction

Jute (*Corchorus olitorius*) is an important fibre crop, which grows during summer months (March to July) in Bangladesh. Heavy weed infestation is therefore a general view of jute cultivation. The yield loss of crop due to weed competition depends mainly on its competitive ability. The competitive ability of crops and weeds with each other depend on many factors including the time emergence, how fast each starts growing in relation to other, its neighbouring weed species and is mainly influenced by environmental conditions (Spitters *et al.*, 1989; O'Donovan, 1992). In crop fields weeds usually emerge in successive flushes which is different from that of crop emergence (O'Donovan *et al.*, 1985). Therefore, the effect of relative time of weed emergence is an important factor needs to study, to determine the competitive ability of jute correctly.

Cyperus rotundus L. (Purple nutsedge) is an important weed of olitorius jute, which grows throughout the life span of jute. it accumulates more than 60% of total dry matter if is allowed to grow with jute for first six weeks of jute sowing (Saraswat, 1980; Talukder *et al.*, 1989) Therefore, it is important to know the influence of early and late emergence of *C. rotundus* and jute relative to each other on the yield and competitive ability of the crop. This investigation was therefore undertaken to know the effect of early or late-emerged weed (purple nutsedge) on the growth, yield and competitive ability of olitorius jute.

Materials and Methods

The olitorius jute (cv. O-4) was grown in pure stands and in mixture with nutsedge weed raised at different times relative to jute at Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, Bangladesh during the period from May to September, 1994. The treatments were: i) jute early- weed late, ii) jute early- weed early, iii) jute late- weed early, iv) jute late- weed late, v) jute early- weed free, vi) jute late- weed free, vii) weed early- jute free and viii) weed late- jute free. The treatments were allocated randomly within the blocks of a RCB design. The land was fertilized with cowdung, urea, triple super phosphate and muriate of potash at the rate of 3720, 112, 17 and 22kg ha⁻¹ respectively. Jute was sown in rows 30cm apart on 1st May as early and 10th May as late sowing. The weed tubers were planted

at the rate of 80/m² at 10 days early or late in relation to jute sowing. Thinning of jute seedling was done 15 days after the crop emergence to maintain the plant to plant distance of 10cm. The unsown weeds were removed from the plot time to time, to avoid the extra competition. The crop was harvested at 120 days after sowing when the crop was at a stage of 30% flowering. Underground parts of the weed and jute plants were collected and weight of total dry matter was recorded. Retting of jute was done in pond water and the fibre was dried properly to record the fibre yield.

Competitive ability of jute was measured by aggressivity, the difference between relative yields of jute and the weed as proposed by McGilchrist and Trenbath (1971). The collected data were analyzed statistically using the "MSTAT" statistical programme and the mean differences were adjudged as per DMRT.

Results and Discussion

Effect on fibre yield: Relative time of weed and jute emergence significantly affected the fibre yield of jute (Table 1). The jute without weed gave the highest yield (0.82kg/m²), while the lowest yield (0.51kg/m²) of jute was obtained from the jute mixed with early-sown weeds.

Therefore, on an average more than 31% fibre yield was reduced due to weed competition. The magnitude of yield reduction varied due to different time of weed emergence relative to jute. When weed emerged 10 days earlier than jute the yield was reduced by 39%, but when weed was emerged 10 days later than the crop the yield was reduced by 16%. The growth of weed and jute together at early-sown and late-sown conditions led to a reduction of 25%. In late-sown conditions, when jute was grown 10 days earlier than the crop it reduced the yield by 37%. In general the crop produced more than 11% extra yield due to early sowing irrespective of weed sowing times and about 14% more reduction of yield occurred due to early sowing of weed irrespective of jute sowing times.

Effect on total dry matter: Time of weed emergence relative to jute caused a significant influence on the dry matter accumulation of jute per plant (Table 2). Jute plants accumulated the maximum dry matter (95.25Kg/plant) when grown without weed, while the lowest dry matter was obtained from the late-emerged jute plants mixed with early-emerged weed (61.0Kg/plant). On an average, about 36% dry matter was reduced due to competition from early-emerged weeds. When weed emerged 10 days later than jute it reduced dry matter by about 17%, whereas the reduction was about 20% when weed and jute were grown together in early-sown condition. The magnitude of dry matter reduction was more in late-sown condition. In general, only 2% extra dry matter of jute was produced due to early sowing of jute irrespective of weed sowing time and about 11% less jute dry matter was produced due to early emergence of weed irrespective of jute sowing times.

Accumulation of weed dry matter was also influenced significantly by the relative time of weed and jute sowing (Table 3). The highest accumulation of weed dry matter was found in early-sown weed without jute (41.75g/plant), while the lowest accumulation (19.0g/plant, 52% loss in comparison with jute-free weed) occurred when the weed was raised 10 days later with early-sown jute. On an average weed dry matter was reduced by 35% due to competition from jute (mean of early and late sowings). In early-sown crop when the jute and weed grown together jute reduced about 31% weed dry matter, whereas when the weed was grown

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Table 1: Fibre yield (kg/m²) of olitorius jute as affected by relative time of weed and jute emergence

Time of weed emergence	Time of jute emergence		Mean
	Early	Late	
Early	0.62 (25.3 %)	0.51 (37.0 %)	0.56c (31.7 %)
Late	0.70 (15.7 %)	0.61 (24.7 %)	0.65b (20.7%)
Mean of mixture	0.66 (20.5%)	0.56 (30.9 %)	---
Weed free	0.83	0.81	0.82a
Mean	0.71a	0.64b	

Table 2: Total dry matter (g/plant) of olitorius jute as affected by relative time of weed and jute emergence

Time of weed emergence	Time of jute emergence		Mean
	Early	Late	
Early	76.50 (19.7 %)	61.00 (34.6 %)	68.75c (27.1 %)
Late	79.50 (16.5 %)	74.25 (20.4 %)	76.87b (18.4 %)
Mean of mixture	78.00 (18.1 %)	67.63 (27.5 %)	--
Weed free	95.25	93.25	94.25a
Mean	83.75a	76.16b	

Table 3: Total dry matter (g/plant) of *C. rotundus* as affected by relative time of weed and jute emergence

Time of jute emergence	Time of weed emergence		Mean
	Early	Late	
Early	29.00 (30.5 %)	19.00 (50.0 %)	24.25c (39.2 %)
Late	31.25 (25.1 %)	23.75 (37.5%)	27.50b (31.0 %)
Mean of mixture	30.13 (27.8 %)	21.63 (43.1 %)	--
Jute free	41.75	38.00	39.87a
Mean	34.00a	27.08b	

Figures in parentheses indicate per cent reduction due to competition; Figures in same column or row having different letters indicate significant difference at P < 0.05

Table 4: Aggressivity of olitorius jute as affected by relative time of weed and jute emergence

Time of jute emergence	Time of weed emergence		
	Early	Late	Mean
Early	0.11	0.32	0.22a
Late	0.09	0.17	0.13b
Mean	0.10b	0.25a	

Figures in same column or row having different letters indicate significant difference at P < 0.05

10 days earlier than the crop the reduction was about 25%. In late-sown situation the range of dry matter reduction of weed was more (Table 3). In general, more than 20% extra dry matter was produced due to early sowing of weed irrespective of jute sowing time and about 12% less weed dry matter was produced due to early sowing of jute irrespective of weed sowing times.

Competitive ability of jute: The effects on the dry matter of jute and the weed were reflected on its competitive ability. The aggressivity of jute, which is the difference between the relative dry matter yields per plant of jute and the weed, was found to be significantly influenced by the relative time of weed and jute emergence (Table 4). The highest aggressivity (Aggr = 0.32) of jute was noted when the crop was raised early and weed was grown 10 days later than the crop and the lowest aggressivity value (Aggr = 0.09) was found in late-emerged jute with early-emerged weed. In general the crop was more aggressive (69% more than late-sowing) when it was raised early if the effect of weed emergence time was ignored. Similarly, the crop was more competitive (150% more than early-sown weed) when the weed was raised 10 days later irrespective of time of jute sowing. In early-sown weeds when jute was raised 10 days later than the weed the aggressivity of jute was reduced by more than 18% than early-sown jute. On the other hand, in late-sown weeds when jute was raised 10 days earlier the aggressivity was increased by more than 88% than late-sown jute. Early-sown jute gained an advantage over late-sown weeds and became more established to compete for important growth essentials. In

contrary, when weeds emerged early, it gained an advantage over the crop and made the crop less competitive. These results are in agreement with that of O'Donovan (1992), Blackshaw (1993), Hakansson (1997).

Therefore, it can be concluded that olitorius jute should be free from nutsedge infestation from the beginning of its life span, especially early emergence (even 10 days earlier than crop) of the weed must be avoided to get adequate fibre yield of jute. In the area where nutsedge is a great problem for jute, the crop should make more competitive by sowing it comparatively earlier in the season.

References

- Blackshaw, R.E., 1993. Downy brome density and relative time of emergence affects interference in winter wheat. *Weed Sci.*, 41: 551-556.
- Hakansson, S., 1997. Competitive effects and competitiveness in annual plant stands. 2. Measurement of plant growth as influenced by density and relative time of emergence. *Swedish J. Agric. Res.*, 27: 75-94.
- McGilchrist, C.A. and B.R. Trenbath, 1971. A revised analysis of plant competition experiments. *Biometrics*, 27: 659-671.
- O'Donovan, J.T., E.A. de St. Remy, P.A. O'Sullivan, D.A. Dew and A.K. Sharma, 1985. Influence of relative time of emergence of wild oat (*Avena fatua*) on yield loss of barley (*Hordeum vulgare*) and wheat (*Triticum aestivum*). *Weed Sci.*, 33: 498-503.
- O'Donovan, J.T., 1992. Seed yields of canola and volunteer barley as influenced by relative time of emergence. *Can. J. Pl. Sci.*, 72: 263-267.
- Saraswat, V.N., 1980. A decade of weed control in jute - A Review. *Tropical Pest Mgt.*, 26: 45-50.
- Spitters, C.J.T., M.J. Kropff and W.de. Groot, 1989. Competition between maize and *Echinochloa crusgalli* analyzed by hyperbolic model. *Ann. Appl. Biol.*, 115:541-551.
- Talukder, F.A.H., M.K. Ali and M.A.K. Majlis, 1988. Competitive ability of jute to weeds. *Bangla. J. Jute Fib. Res.*, 13: 39-47.