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Effect of different hand weeding regimes on weed management and grain yield of Acha, *Digitaria* species

S. O. Bakare¹, M. G. M. Kolo² and J. A. Adediran²

¹National Cereals Research Institute, P. M. B. 8, Bida, Niger State, Nigeria

²Department of Crop Production, School of Agricultural Technology,
Federal University of Technology, Minna, Nigeria

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ABSTRACT: A split plot experiment with three replicates was carried out in 1999 and 2000 on two accessions of Acha at the experimental site of the National Cereals Research Institute, Badeggi, located at Lat. 09° 45' N; Long. 06° 7' E, Alt. 50.57 MSL. Accession (erect and spread) was in the main plot while the weeding regimes was the sub-plot.

The weeding regimes were: two hand pullings of weeds at 3, & 7; 4 & 8; 5 & 9 and 6 & 10 weeks after sowing (WAS) and weedy check. The experiment was aimed at determining the appropriate hand weeding regimes for weed management and optimum grain yield of Acha (*Digitaria* species). Weeding regime has effect on dry weed weight, weed cover score and grain yield. The earlier the plot is weeded, the lesser the dry weed weight and weed cover score. However, dry weed weight and weed cover score were not influenced by the different accessions of Acha. Grain yield result indicated that first hand pulling of weeds should be carried out between 3 – 4 WAS while the second should be between 7 – 8 WAS.

Key words: Weed control; Hand weeding regimes; Grain yield; Acha; *Digitaria* species.

Introduction

Weeds are serious pests in crop production and thereby demand attention. They compete with crops for soil nutrients, water and light (Labrada and Parker, 1994), deprive crops of limited essential resources, particularly nutrients (Ayeni *et al.*, 1984), hinder crop harvest and allow weed seeds to often contaminate the crop produce (Labrada and Parker, 1994).

Farmers, in most cases, delay weeding of Acha field to almost the end of vegetative phase. A fundamental reason for delaying weeding in crop field is labour shortage. Since selective herbicide to control weeds in Acha field has not been identified (Yayock *et al.*, 1988), farmers still resort to hand weeding method of controlling weeds in Acha. Even though hand weeding becomes cost prohibitive in many areas because of the gradually shrinking labour pool, it is still the commonest method used by the farmers (Akobundu, 1980).

Two hand weeding have been recommended for many annual crops which include rice, maize and soybeans. These crops should be weeded at about 3 and 6 WAS (Upadhyay and Chaudhary, 1979; Obi,

1991; Busari, 1996). Two different hand weeding regimes were therefore evaluated in Acha field with the objective of determining the appropriate weeding regimes for weed management and optimum grain yield.

Materials and Methods

A split plot experiment with three replicates was carried out in 1999 and 2000 on two accessions of Acha at the experimental site of the National Cereals Research Institute, Badeggi, located at Lat. 09° 45' N; Long. 06° 7' E, Alt. 50.57 MSL. The main plot was the accession (erect and spread) while the weeding regimes was the sub-plot.

Land preparation was by ploughing and harrowing on 8 and 11 June, 1999, and 2 and 6 June, 2000, respectively. Sowing by broadcast at 25 kg/ha seed rate was carried out immediately on 11 June, 1999, and 6 June, 2000, to prevent weeds from emerging before Acha crop. The weeding regimes were: two hand pulling of weeds at 3 & 7, 4 & 8, 5 & 9 and 6 & 10 WAS and weedy check.

Visual weed score was done at 4 and 8 WAS before weeding by using a scale of 0 – 10 (where 0 indicates no weed present and 10 indicates complete weed cover). Weed weight was collected at 3 and 8 WAS before weeding with the use of twice-throw of a quadrant of one-metre square per plot. Weeds collected per throw were put inside a sampling envelope and oven-dried at 70°C for four days to obtain a constant dry weight. Average weed weight of the two throws were recorded. Other data included grain yield at 14% moisture content. Analysis of variance was carried out on the data collected with MSTATC software and the means obtained were compared using New Duncan Multiple Range Test.

Results and Discussion

Dry weed weight

Significant differences in dry weed weight occurred only in the weeding regime and not in the accession at 4 WAS both in 1999 and 2000 (Table 1). At 4 WAS, the plots that were weeded at 3 & 7 WAS had mean dry weed weight of 22 kg/ha in 1999 and 10.4 kg/ha in 2000 which were, respectively, lower than those for the other weeding regimes (about 70 – 73) in 1999 and 38 kg/ha in 2000. However, other treatments did not differ significantly from each other. At 8 WAS, significant differences occurred similarly only in the weeding regime and not in the accession (Table 1). Plots weeded at 3 & 7 WAS also had significantly lower mean dry weights of 53.2 kg/ha in 1999 and 5.9 kg/ha in 2000. Highest mean dry weed weight of 488.6 kg/ha and 337 kg/ha was obtained in the weedy check both in 1999 and 2000 respectively. The significant differences in the weed weight among the weeding regimes indicated that weeding regime had influence on dry weed weight. However, dry weed weight was not influenced by differences in accession.

Weed cover score

Apart from the plots weeded at 3 & 7 WAS that had weed cover score of 1.0, other treatments had 3.0 at 4 WAS (Table 2). At 8 WAS, plots weeded at 3 & 7 WAS still had the lowest mean value of 1.7 and 1.3 in 1999 and 2000, respectively. Similar to the results obtained for dry weed weight, the earlier the plot was weeded the lower the weed cover score.

Grain yield

Significant differences occurred in grain yield both in the accession and weeding regime in 1999 and 2000 (Table 3). The accession had higher mean grain yield than the erect. Significantly low mean grain yield of 67.5 kg/ha and 73.4 kg/ha were obtained in the weedy control plots in 1999 and 2000 respectively. Hand pulling at 3 & 7 WAS and at 4 & 8 WAS gave the highest grain yield in both accessions (352 kg/ha in 1999 and 361 kg/ha in 2000) but the two weeding regimes were not significantly different from each other. Grain yield result indicated that hand pulling of weeds should be between 3 and 4 WAS while the

Table 1: Effect of weeding regimes on dry weed weight (kg/ha) in Acha in 1999 and 2000.

Weeding regime(WAS)	1999						2000					
	4 WAS			8 WAS			4 WAS			8 WAS		
	Accession	Spread	Erect	Mean	Spread	Erect	Accession	Spread	Erect	Mean	Spread	Erect
Weedy check		72.0	68.0	70.0 ^a	484.0	493.2		37.7	39.3	38.5 ^a	337.3	336.7
Hand pulling at 3 & 7		24.0	20.0	22.0 ^b	53.2	53.2		10.7	10.0	10.4 ^b	5.7	6.0
Hand pulling at 4 & 8		73.2	73.2	73.2 ^a	153.2	166.8		38.0	38.0	38.0 ^a	123.3	123.3
Hand pulling at 5 & 9		73.2	72.0	72.6 ^a	146.8	160.0		38.7	39.0	38.9 ^a	93.3	93.3
Hand pulling at 6 & 10		73.2	68.0	70.6 ^a	120.0	113.2		38.3	38.0	38.2 ^a	65.0	65.0
Mean		63.1 ^a	60.2 ^a		191.4 ^a	197.3 ^a		32.7 ^a	32.9 ^a		124.9 ^a	124.9 ^a
SE ± Accession =	1.8				8.0		0.3				1.7	
Weeding regime =	3.2				28.8		0.9				3.1	
Interaction =	4.6				40.8		1.2				4.3	
CV%		9.1			25.7		6.7				22.5	

Figures with the same letter in the same column are not significantly different at P = 0.05 of DMRT.

Table 2: Effect of weeding regimes on weed cover score in 1999 and 2000.

Weeding regime(WAS)	1999				2000			
	4 WAS		8 WAS		4 WAS		8 WAS	
	Accession	Accession	Accession	Accession	Accession	Accession	Accession	Accession
	Spread	Erect	Mean	Spread	Erect	Mean	Spread	Erect
Weedy check	3.0	3.0	3.0	5.7	5.7	5.7	3.0	5.3
Hand pulling at 3 & 7	1.0	1.0	1.0	1.7	1.7	1.7	1.0	1.3
Hand pulling at 4 & 8	3.0	3.0	3.0	2.7	2.7	5.7	3.0	3.0
Hand pulling at 5 & 9	3.0	3.0	3.0	2.7	2.3	2.5	3.0	3.0
Hand pulling at 6 & 10	3.0	3.0	3.0	2.0	2.0	2.0	3.0	1.3
Mean	2.6	2.6		3.0	2.9		2.6	2.8

Table 3: Weeding regime effect on grain yield (kg/ha) of Acha in 1999/2000

Weeding regime(WAS)	1999			2000		
	Accession			Accession		
	Spread	Erect	Mean	Spread	Erect	Mean
Weedy check	90.0	45.0	67.5 ^c	85.0	61.7	73.4 ^d
Hand pulling at 3 & 7	416.3	286.7	351.5 ^a	430.0	293.0	361.5 ^a
Hand pulling at 4 & 8	416.3	288.3	352.3 ^a	426.7	294.0	360.4 ^a
Hand pulling at 5 & 9	378.7	200.7	289.7 ^{ab}	345.0	194.7	269.9 ^b
Hand pulling at 6 & 10	300.0	189.3	244.7 ^b	250.0	165.0	207.5 ^a
Mean	400.3 ^a	252.5 ^b		307.3 ^a	201.7 ^b	
SE ±	Accession			Accession		
	2.6			3.4		
	Weeding regime			18.5		
	38.8			26.1		
	Interaction			25.7		
	54.9			12.6		
CV%	25.7			12.6		

Figures with the same letter in the same column are not significantly different at P = 0.05 of DMRT.

second should be between 7 and 8 WAS. This recommendation would however hold only when the land preparation before sowing was properly carried out and when there was no delay in sowing after land preparation.

Conclusion

The necessity to control weed in crops emanated from the adverse effect of weeds on crops through the competition with crops for soil nutrients, water and light. The earlier the plot is weeded the lower the weed dry weight and weed cover score. First hand pulling of weeds should be between 3 and 4 WAS while the second should be between 7 and 8 WAS.

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