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Interference of common lambsquarters and wild onion in winter onion

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ABSTRACT

Field experiments were conducted during winter seasons of the year 2002-03 and 2003-04 to study the effect of increasing densities of common lambsquarters (*Chenopodium album* L.) and wild onion (*Asphodelus tenuifolius* Cav.) on the productivity of winter onion. There was significant decrease in onion bulb yield even with density of *C. album* at 5 plants/m^2 compared to weed free treatment. The per cent yield reduction ranged from 16 to 40% at densities of *C. album* from 5 to 160 plants/m^2 over weed free treatment, respectively. Similarly, 80 plants/ m^2 of *A. tenuifolius* and more caused significant reduction in onion bulb yield as compared to weed free treatment. The onion bulb yield reduced from 2.6 to 52.6% by increasing the density of *A. tenuifolius* from 20 to 640 plants/m^2, respectively over weed free treatment.

Key words: Common lambsquarters, Density, Interference, Onion, Wild onion,

Onion (*Allium cepa* L.) is one of the important vegetable crops grown in India. The crop yields are reduced by weed infestation due to slow emergence, low initial growth rate, long vegetative period and low competing ability of onion plants (Dunan *et al.* 1996). Reduction in bulb yield in the range of 40-80 % due to weed infestation has been reported by Mondal (1997) and Kolhe (2001). The winter onion crop is mainly infested with broad-leaf weeds. Common lambsquarters (*Chenopodium album L.*) is amongst the major weeds causing yield reduction in bulb yield of onion. Wild onion (*Asphodelus tenuifolius* Cav.) a weed almost similar in above ground vegetative growth as that of onion is spreading fast in winter crops particularly in northern and central India. Yield reduction depends upon the density of weeds infesting the crop. Hence, the present investigation was carried out to study the effect of different densities of these two dominating weeds on the productivity of winter onion.

MATERIALS AND METHODS

Two field experiments were conducted during *rabi* seasons of 2002-03 and 2003-04 at the National Research Centre for Weed Science, Jabalpur. The soil of the experimental site was clay loam (Typic Chromusterts) in texture, neutral in reaction (pH 6.9) and analyzing low in available N (220 kg/ha), medium in available P (16.0 kg/ha) and high in available K (465 kg/ha) contents. The treatments consisted of 7 densities of *C. album* (0, 5, 10, 20, 40, 80 and 160 plants/m^2) with uniform density of 50 plants of onion/m^2 in the first experiment, while 7 densities of *A. tenuifolius* (0, 20, 40, 80, 160, 320 and 640 plants/m^2) were tested with uniform density of 50 plants of onion/m^2 in the second experiment. The treatments in both the experiments were fitted in a randomized block design with four replications. Onion variety "Nasik Red" was transplanted with planting geometry of 20x10 cm in micro-plots of 1 m^2 in the last week of December during both the years of study. The density levels of weeds were maintained artificially by sowing weed seeds. The weed free plots were maintained by uprooting emerged weeds at regular intervals. A common fertilizer dose of 80 kg N + 40 kg P_2O_5/ha was applied to the onion crop.The data on the effect of weed densities on per cent yield reduction in onion was fitted in non-linear equations. The relationship between densities of *C. album* and yield reduction in onion was best fitted in a logarithmic model:

$$Y = a + bx \ln.x$$

where, Y denotes per cent reduction in onion yield; a = estimate of Y in absence of *C. album* ; b = estimate of the rate of reduction in onion yield at densities of *C. album*, ln = natural log and x = *C. album* density.The relationship between densities of *A. tenuifolius* and yield reduction in onion was best fitted in a cubic model i.e., $Y = a + b. \ln x$ where, Y denotes per cent reduction in onion yield, a = estimate of Y in absence of *A. tenuifolius*; b, c and d are the estimates of the rate of reduction in onion yield at densities of *A. tenuifolius* and x = *A. tenuifolius* density.

RESULTS AND DISCUSSION

Effect of *Chenopodium album* densities

The dry weight of *C. album* increased at increasing densities from 5 to 160 plants/m^2. The per cent increase in mean weed dry weight was 50% at 10 plants/m^2

compared to 5 plants/m^2, whereas increasing *C. album* density from 80 to 160 plants/m^2 recorded only 13.7% increase in dry weight mainly due to inter-plant competition at higher densities of the weed. The seed yield of *C. album* also increased from 128.3 g/m^2 to 413.7 g/m^2 by increasing its densities from 5 to 160 plants/m^2, respectively (Table 1).

The onion bulb yield was maximum in weed free plots, which significantly decreased by 16.0 to 40.0% with increasing densities of *C. album* at 5 and 160 plants/m^2, respectively. Regression analysis conducted for yield reduction indicated a non - linear (logarithmic model, R^2= 0.9884) yield response over the weed densities (Fig.1).

Effect of *Asphodelus tenuifolius* densities

The dry weight of *A. tenuifolius* increased with its increasing densities from 20 to 640 plants/ m^2. However, significant increase in dry weight was recorded at 160

Table 1. Effect of different densities of *C. album* on its dry weight, seed yield (mean of 2 years) and onion bulb yield

C. album density/m^2	Dry weight of *C. album* (g/m^2)			Onion bulb yield (kg/m^2)			*C. album* seed yield (g/m^2)
	2003	2004	Mean	2003	2004	Mean	
0	-	-	-	7.6	7.4	7.5	-
5	86	140	113.0	6.4	6.2	6.3	128.3
10	122	217	169.5	6.3	5.5	5.9	196.5
20	129	343	236.0	5.5	4.8	5.2	249.6
40	198	347	272.5	5.3	4.7	5.0	285.2
80	206	403	304.5	5.0	4.7	4.9	355.9
160	279	410	344.5	4.9	4.0	4.5	413.7
LSD (P=0.05)	29	32	-	0.9	1.0	-	54.8

Table 2. Effect of densities of *A. tenuifolius* on its dry weight, seed yield (mean of two years) and onion bulb yield

A. tenuifolius density/m^2	Dry weight of *A. tenuifolius* (g/m^2)			Onion bulb yield (kg/m^2)			*A. tenuifolius* seed yield (g/m^2)
	2003	2004	Mean	2003	2004	Mean	
0	-	-	-	7.7	7.5	7.6	-
20	32	23	27.5	7.4	7.4	7.4	28.1
40	36	52	44.0	6.9	6.6	6.8	42.5
80	44	67	55.5	6.8	6.5	6.7	47.4
160	114	133	123.5	6.4	5.3	5.9	83.1
320	131	173	152.0	4.9	4.9	4.9	115.3
640	243	260	251.5	3.3	3.8	3.6	140.9
LSD (P=0.05)	27	25	-	0.8	0.9	-	24.8

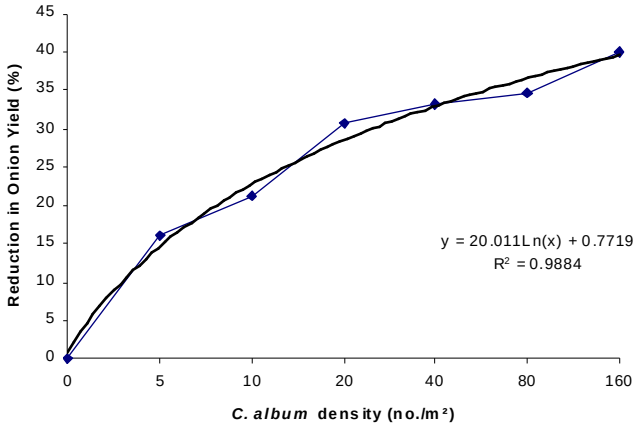

Fig. 1. Per cent yield reduction in onion as influenced by density levels of *C. album*.

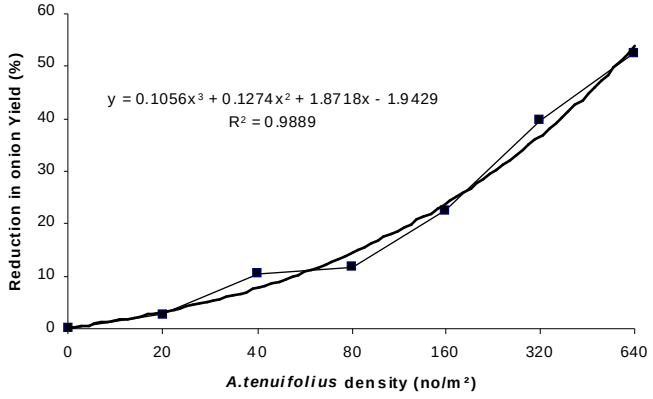

Fig. 2. Percent yield reduction in onion as influenced by density levels of *A. tenuifolius*.

plants/m^2 and thereafter each two-fold increase in density significantly increased the dry weight of the weed. The seed yield of *A. tenuifolius* was similar at density of 20 to 80 plants/ m^2 thereafter significant increase in seed yield was noticed up to 640 plants/m^2 (Table 2).

The onion bulb yield reduced with every rise in density of this weed. The density of 80 plants/m^2 and more caused significant reduction in yield as compared to weed free treatment. The reduction in yield ranged from 2.6% at 20 plants/ m^2 to 52.6% at 640 plants/m^2. Regression analysis conducted for yield reduction indicated a non - linear (cubic model, R^2= 0.9889) yield response over the weed densities (Fig.2). The results indicated that wild onion density of 80 plants/m^2 or more can cause significant reduction in onion bulb yield.

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