CHEMICAL WEED CONTROL IN TUBEROSE AND GLADIOLUS

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Abstract

In order to improve the method and reduce the cost of cultivation of tuberose and gladiolus, the effectiveness of 4 herbicides in controlling weeds were studied. Pre-plant application of atrazine (2-chloro-4-ethylamino-6-isopropylamino, 1,3,5-triazine) at 3.0 kg a.i./ha caused the maximum reduction of weeds in tuberose field resulting in the highest yield (10.2 tonnes/ha) of good quality flowers. The corresponding yield from unweeded control plants was only 5.8 tonnes per hectare. The most effective herbicide in controlling the weeds in gladiolus field and promoting the growth and flowering of the crop was found to be oxyfluorfen(2-chloro-1-(3-ethoxy-4 nitrophenoxy)4-(trifluoromethyl) benzene) applied at the rate of 0.5 kg a.i. per hectare. Pre-plant soil spray with this herbicide markedly reduced the weed population and gave the highest yield of 221.1 thousand spikes per hectare as compared to only 162.3 thousand spikes produced in the unweeded control plots.

1. Introduction

Weeds pose a very serious problem in the cultivation of tuberose and gladiolus as heavy manurial and irrigation requirements of these crops create conditions conducive for the rank growth of numerous monocot and dicot weeds. They cause enormous loses to the crops and increase the cost of cultivation.

Manual weed control is effective if done frequently, but this procedure is very expensive. Chemical weed control is comparatively economical, convenient and efficient in eradicating weeds by one or two applications. Treatment with diuron at 2.8 kg a.i. per hectare proved very effective in controlling the weeds from tuberose and gladiolus fields (Chiapparim, 1960). Application of both nitralin and trifluralin was found to be beneficial against grasses and had no adverse effect on flower and corm production of gladiolus (Monaco and Jenkins, 1970).

In order to study the effectiveness of some weedicides in controlling the weeds in tuberose and gladiolus field and also the effect of the treatments on growth, flowering and flower quality of these crops, the present investigation was carried out.

2. Materials and methods

Two separate experiments one with tuberose and the other with gladiolus were conducted simultaneously in a randomised block design with four replications. Bulbs of tuberose cv. Single and corms of gladiolus cv. Vink's Glory were planted in the first week of April and September respectively at a distance of 20 cm between plants and 25 cm between rows.

Pre-plant application of four herbicides i.e. atrazine containing 50 percent a.i. of 2-chloro-4-ethylamino-6-isopropylamino, 1,3,5-triazine, nitrofen containing 25 percent a.i. of 2,4-dichlorophenyl-4-nitrophenyl ether, oxyfluorfen containing 23.5 percent a.i. of 2-chloro-4-(3-ethoxy-4 nitrophenoxy) 4-(trifluoromethyl) benzene and fluchloraline containing 45 percent of N-(2-chloroethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)aniline was done four days before planting and chemicals were thoroughly incorporated into the upper 15 cm of soil by harrowing. Atrazine, nitrofen and fluchloraline were applied at the rate of 2.0 and 3.0 kg a.i./ha while oxyfluorfen was sprayed at the rate of 0.5 and 1.0 kg a.i. per hectare. In weeded control, 12 and 10 hand weedings were done in tuberose and gladiolus fields respectively. The recommended agronomic practices were adopted regularly, except weeding schedule. Data on the weed population, growth and flowering of crops were recorded and are presented in tables and figure. For comparing the economics of herbicidal treatments, the cost of each treatment was deducted from the gross income of the respective treatment. The additional income from each treatment was worked out after deducting the net income of respective treatment from that of weeded and unweeded controls.

3. Results

3.1. Tuberose

3.1.1. Weed flora

Weeds were noticed within 7 days after planting of bulbs and the unweeded control plots were fully covered with weeds in about 100 days of planting. The monocot weeds collected and identified from the experimental plots included *Cynodon dactylon*, *Cyperus rotundus*, *C. iria* and *Echinocloa crusgali*. The dicot weeds were *Ageratum conyzoides*, *Digera arvensis*, *Eclipta alba* and *Ludwigia parviflora*.

3.1.2. Weed population and dry weight of weeds

Application of chemicals caused a remarkable

reduction in the weed population and dry weight of weeds as compared to the unweeded control (Figure 1). The most effective weed control was obtained by the use of atrazine at 1.0 kg a.i./ha which reduced the number and dry weight of weeds by 76.1 and 84.8 percent respectively over the unweeded check. This was followed by the treatment of oxyfluorfen at 0.5 kg a.i./ha, reducing the weed count by 71.1 and dry weight by 72.5 percent. No phytotoxic effect on the plants was recorded due to the treatment with weedicides.

3.1.3. Plant growth

It is evident from the data in Table 1 that treatment with different herbicides markedly improved the growth of the crop plants. Among the four chemicals used, atrazine proved superior than the others and treatment with this chemical at 3.0 kg a.i./ha caused the maximum plant height (leaf length) and resulted in 47.9 percent more leaves as compared with the unweeded control. Similarly, application of oxyfluorfen at 0.5 kg a.i./ha was also found effective in increasing the number of leaves per clump.

3.1.4. Flowering

Pre-plant application of herbicides significantly increased the production of spikes and flowers. Treatment with atrazine at 3.0 kg/ha was noted to be the best treatment which enhanced the number of flowers per clump by 109.0 percent compared to the plants in unweeded control. The yield of flowers in tonnes per hectare also showed a marked increase from 5.8 tonnes in unweeded control to 10.2 tonnes per hectare with the above treatment. It was also noted that the diameter of flower increased with the increase in concentration of all the chemicals used in this experiment (Table 1).

3.1.5. Economics

Considering the economics of the different treatments as shown in Table 3 it was observed that atrazine at 2.0 and 3.0 and oxyfluorfen at 0.5 kg a.i./ha gave the additional income of Rs. 2102, 13792 and 1589 respectively, per hectare over the weeded control.

3.2. Gladiolus

3.2.1. Weed flora

The predominent weed species present in gladiolus field were as below.

Monocot weeds : Cynodon dactylon,
Cyperus rotundus,
Echinocloa crusgali,
Eragrostis tenella and
Scirpus sguarrosus.

Dicot weeds : *Ageratum conyzoides*, *Chenopodium album*, *Cleome viscosa*, *Euphorbia hirta*, *Digera muricata* and *Indigoflera glabra*.

3.2.2. Weed population and dry weight of weeds

All the herbicidal treatments caused a significant reduction in weed population and dry weight of weeds as compared to the unweeded control. Among the chemicals, oxyfluorfen and atrazine were found to be very effective in controlling the weeds and thereby decreasing the dry weight of weeds (Figure 1). The number of weeds in unweeded plot was 163.0 weighing 292.3 g while in those treated with oxyfluorfen at 1.0 kg a.i./ha, it was 40.3 weighing only 74.2 g.

3.2.3. Plant growth

The data in Table 2 clearly indicated that pre-plant treatment with the lower concentration of oxyfluorfen (0.5 kg a.i./ha) markedly promoted the elongation of leaf followed by atrazine applied at 3.0 kg a.i./ha. Variation in leaf number per plant under the different treatments were also significant and the higher concentrations of the chemicals, except in case of oxyfluorfen, were more responsive than the lower doses.

3.2.4. Flowering

Like plant growth, flower production in treated plants was also markedly improved as compared to the unweeded control (Table 2). The most effective herbicide in promoting the flowering of the crop was recorded to be oxyfluorfen and pre-plant spray of this chemical at the rate of 0.5 kg a.i./ha gave the highest yield of spikes bearing the largest number of bigger size of florets. The chemical also stimulated the length of spike. Atrazine applied at 3.0 kg a.i./ha was also found effective in improving the flower production.

3.2.5. Economics

The data presented in Table 3 showed that oxyfluorfen at 0.5 kg a.i./ha gave higher profit than the weeded control. The next best herbicide appears to be atrazine.

4. Discussion

Applications of herbicides used in this investigation proved effective in controlling both monocot and dicot weeds leading the better growth of both the crops. In case of unweeded control, on the other hand, plant growth was severely suppressed due to the presence of larger number of

weeds which utilized the nutrients and moisture from the soil. Similarly, the flower production increased in the treated plants and it was mainly due to the improvement in the growth of the plants which ultimately resulted in the production of greater number of spikes and flowers of bigger sizes. Among the weedicides, atrazine and oxyfluorfen were found superior than the others. But their effectiveness on weed control, growth and flowering of crops differ depending on the concentration and species of flower crop. Application of atrazine at 3.0 kg a.i./ha and oxyfluorfen at 0.5 kg a.i./ha caused the maximum reduction of weeds in tuberose and gladiolus field respectively resulting in the highest yield of better quality flowers. Marked reduction in weed population resulting in better growth and flowering in H i p p e a s t r u m with the pre-emergence application of Weedone 2,4,5-T was also reported by Jana and Bose (1981). The results of the present investigation are in confirmity with those reported by Dutta (1985).

Treatment with atrazine at 3.0 kg a.i./ha in tuberose and oxyfluorfen at 0.5 kg a.i./ha in gladiolus field was found to be highly economic. Christensson (1982) also calculated the cost of weed control in beds of ornamental plants and reported that chemical weed control was the cheapest while manual weed control appeared to be the most expensive. It is concluded that the pre-plant application of atrazine at 3.0 kg a.i. and oxyfluorfen at 0.5 kg a.i. per hectare in tuberose and gladiolus field respectively can be practiced for controlling the weeds and obtaining higher yield of better quality flowers.

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Table 1 - Effect of herbicides on growth and flowering of tuberose.

Treatment (Kg a.i./ha)	Plant height (cm)	Number of leaves/ clump	Number of flower spikes/clump	Number of flowers/ clump	Flower diameter(cm)	Flower yield (t/ha)
Atrazine						
2.0	51.7	74.6	2.0	68.4	3.5	7.8
3.0	63.4	90.4	2.5	82.2	3.7	10.2
Nitrofen						
2.0	51.6	61.2	1.6	49.2	3.3	6.1
3.0	52.2	63.8	1.8	57.6	3.4	6.5
Oxyfluorfen						
0.5	59.7	79.7	2.0	69.8	3.4	7.7
1.0	55.8	66.1	1.8	57.8	3.5	6.6
Fluchloraline						
2.0	50.9	60.3	1.5	42.6	3.3	6.0
3.0	50.0	66.0	1.6	48.9	3.4	6.3
Weeded control	63.0	85.6	2.2	76.0	3.7	9.0
Unweeded control	48.0	61.1	1.3	39.2	3.0	5.8
C.D. at 5%	2.75	8.28	0.07	2.16	0.15	0.45

Table 2 - Effect of herbicides on growth and flowering of gladiolus.

Treatment (Kg a.i./ha)	Plant height (cm)	Number of leaves/ plant	Spike length (cm)	Number of florets/ spike	Flower diameter (cm)	Spike yield (thousand/ha)
Atrazine						
2.0	67.2	10.0	70.4	15.5	9.2	205.5
3.0	70.3	13.3	74.8	16.7	10.8	221.0
Nitrofen						
2.0	65.1	9.0	69.0	14.2	9.0	203.2
3.0	67.0	9.4	70.8	16.2	9.4	202.4
Oxyfluorfen						
0.5	74.9	14.0	79.6	20.2	11.0	221.4
1.0	60.0	8.0	69.0	10.0	7.4	180.3
Fluchloraline						
2.0	63.0	9.0	68.2	14.4	9.0	202.0
3.0	65.3	9.6	69.0	15.0	9.0	201.3
Weeded control	71.0	13.0	78.0	20.0	10.8	220.0
Unweeded control	48.1	8.8	64.8	12.6	7.8	162.3
C.D. at 5%	2.03	0.90	1.04	0.81	0.58	6.03

Table 3 - Economics of weed control in tuberose and gladiolus.

Treatment (Kg a.i./ha)	Tuberose			Gladiolus		
	Value of yield (Rs./ha)	Cost of treatment (Rs./ha)	Return over weeded control(Rs./ha)	Value of yield (Rs./ha)	Cost of treatment (Rs./ha)	Return over weeded control (Rs./ha)
Atrazine						
2.0	39,150	448	+2102	133575	448	-35873
3.0	51,050	658	+13792	143650	658	-26008
Nitrofen						
2.0	30,550	748	-6798	101600	748	-68148
3.0	32,650	1108	-5058	131560	1108	-38548
Oxyfluorfen						
0.5	38,500	311	+1589	176880	311	+7569
1.0	33,050	595	-4145	90150	595	-79445
Fluchloraline						
2.0	30,050	534	-7084	101000	534	-68536
3.0	31,050	764	-6314	100650	764	-69144
Weeded control	45,000	8400	0	176000	7000	0
Unweeded control	29,150	0	-7450	81150	0	-87850
C.D. at 5%	-					

+ denotes increased profit over unweeded/weeded control, - denotes decreased profit

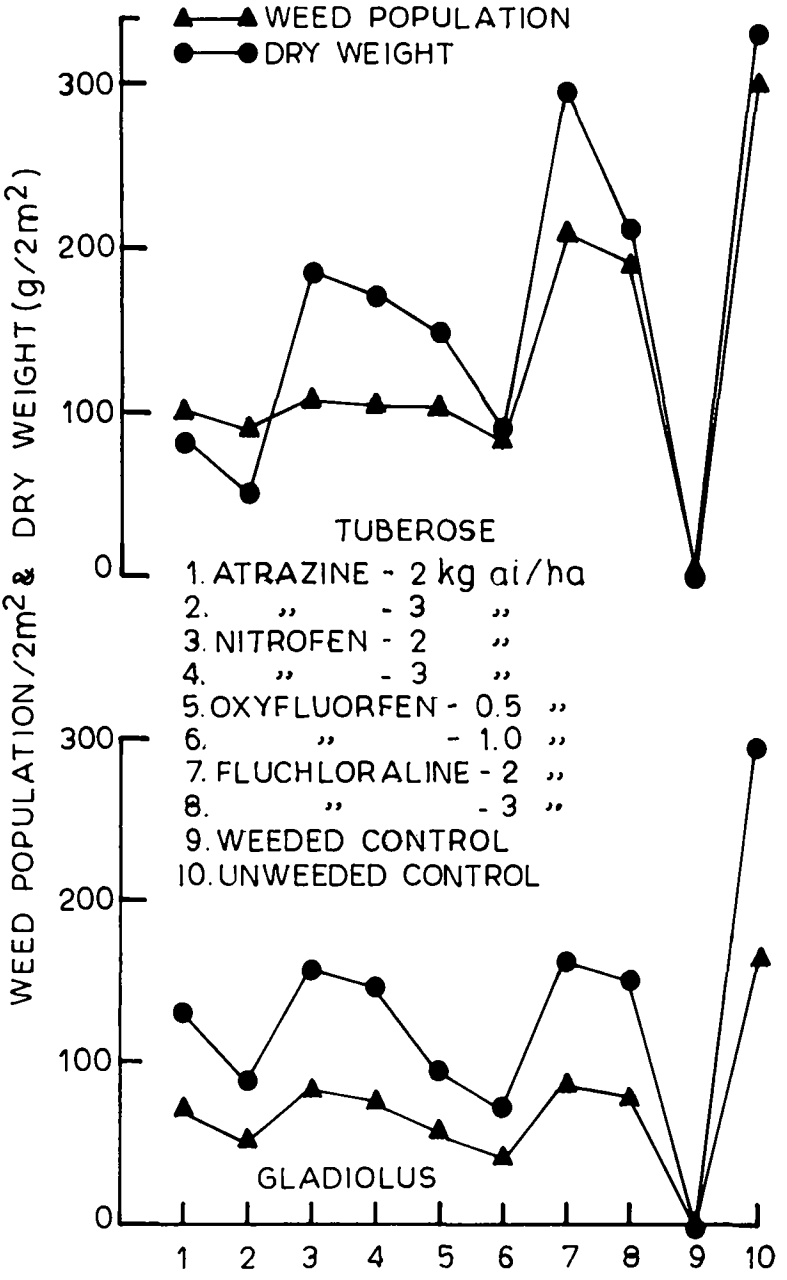

FIGURE 1. EFFECT OF HERBICIDES ON WEED POPULATION AND DRY WEIGHT OF WEEDS OBTAINED IN TUBEROSE AND GLADIOLUS FIELD.