International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 2597-2599

Received: 24-05-2019
Accepted: 25-06-2019

Sivakumar V
AICRP on Spices Centre, HRS, Chintapalli, Dr. YSRHU, Visakhapatnam, Andhra Pradesh, India

Ravindrakumar K
HRS, Kovvur, Dr. YSRHU, West Godavari, Andhra Pradesh, India

Chandrasekhar C
AICRP on Spices Centre, HRS, Chintapalli, Dr. YSRHU, Visakhapatnam, Andhra Pradesh, India

Bhagavan BVK
HRS, Kovvur, Dr. YSRHU, West Godavari, Andhra Pradesh, India

Nirmal Babu K
Indian Institute of Spices Research, Calicut, Kerala, India

Correspondence
Sivakumar V
AICRP on Spices Centre, HRS, Chintapalli, Dr. YSRHU, Visakhapatnam, Andhra Pradesh, India

Evaluation of pre and post emergence herbicides for effective weeds control in Ginger

Sivakumar V, Ravindrakumar K, Chandrasekhar C, Bhagavan BVK and Nirmal Babu K

Abstract
A field experiment was carried out at Horticultural Research Station, Chintapalli to find out efficient and economic weed management practices for ginger under High altitude and tribal zone of Visakhapatnam condition. The experiment was conducted during *Kharif* 2012-13 to 2016-17 in randomized block design with twelve treatments and three replications. Pre emergence application of oxyflurofen 0.30 kg/ha at 2 days after sowing followed by post emergence application of quazilophop ethyl 0.05 kg/ha at 30 days after sowing followed by hand weeding at 90 days of crop stage is effective and economical for weed management in ginger crop with significantly recorded high fresh rhizome yield (22.79 t/ha) with B:C ratio of 2.96 and was on par with hand weeding at 30, 60, 90 and 120 DAS, which recorded the highest fresh rhizome yield (23.85 t/ha). Uncontrolled weed growth reduced rhizome yield by 88%.

Keywords: Ginger, herbicides, weed management

Introduction
Ginger (*Zingiber officinale* Rosc.) is an important spice belongs to the family Zingiberaceae valued for it's aroma, flavor and also for it's medicinal properties. Ginger contains gingerol, an oleoresin that accounts for the characteristic aroma and therapeutic properties. Components of gingerol posses beneficial properties for the treatment of poor digestion, heart burn, vomiting and preventing motion sickness. It is mainly grown in Nigeria, India, China, Indonesia, Thailand and Nepal. In India, it is mainly grown in an area of 1.65 lakh hectares with an annual production of 10.81 lakh MT with productivity of 6.57 MT per hectare mainly in the states of Karnataka, Assam, Odisha, West Bengal, Madhya Pradesh (NHB 2017). Ginger is a slender perennial herb usually grown as annual. It grows well in warm and humid tropics from sea level up to 1500 meters above MSL. It is usually grown as rainfed crop and moderate to heavy rainfall is ideal. It thrives best in well drained sandy, clay loam, red loam or lateritic loam soil rich in humus. It is sensitive to water logging. The area under ginger cultivation in Andhra Pradesh has declined from 3000 ha in 2010-11 to 500 ha in 2016-17. The major constraint in the production of ginger in the state is high incidence of rhizome rot and infestation by large number of weeds.

As the crop is slow in sprouting and long duration, the crop is highly susceptible to weed competition especially in the initial stages of crop growth, thus yield loss as a result of weed competition is expected to be tremendous. Weeds compete with ginger for moisture, nutrients and space. Weed competition has also been identified as a constraint to root and tuber production (Unamma, 1984) [8]. Studies by the All India Coordinated Research Project on Weed control indicated that 30-45 per cent yield reduction in ginger may occur due to uncontrolled weed growth (KAU, 2006) [3] and Eshetu and Addisu (2015) [1] recorded when weeding was totally ignored yield reduction as a result of uncontrolled weed growth amounted 100% under Jimma conditions.

Generally, two to three hand weedings are done depending on weed growth (Mohanthy *et al*., 1990) [4]. Though two to three times hand weeding give good control of weeds, lack of labour availability and high labour charges are serious problems. Even though many technical options are available for weed control in ginger, choice of the method depends up on location, method of cultivation cost, season, availability of labour, etc. Use of herbicides is an important practice for the most crops as it is easier, time and labour saving and economical compared to the other weed control measures (Rekha *et al*., 2003) [7].

The Horticultural Research Station, Chintapalli located at an altitude of 950 m MSL with annual rainfall of 1400 mm which is highly suitable for year round emergence and growth of highly competitive perennial and annual weed species such as *Cynodon spp., Cyprus rotendus, Phyllanthus nururi, Oxalis latifolia, Solanum nigram, Physalis minima, Mimosa pudica,* etc,. Since ginger is a long durational crop, pre-emergence application of herbicides alone does not control weeds throughout critical crop weed competition period and needs an integration of post-emergence application of herbicide or inter-culture operation in combination with pre-emergence herbicide application.

In spite of the divers and highly competitive weed flora existing in the ginger growing areas, research information on ginger weed management is quite meagre. In this point of view this experiment was conducted under high altitude conditions of Andhra Pradesh.

Material and Methods

A Field experiment was conducted during *Kharif* season of 2012-13 to 2016-17 at Horticultural Research Station, Chintapalli, Visakhapatnam, Andhra Pradesh. The experiment was conducted in randomized block design with twelve treatments and three replications to find out efficient and economic weed management practices for ginger. The research station falls within 117º.13' N latitude and 84º.33' E longitude and its average altitude above the 930 m MSL. The climate is Sub-humid with high seasonal variation with mean annual rainfall of 1400 mm. The ginger variety 'Nadia' was sown on raised bed system of plot size 3 × 1m with 30 × 25 cm planting geometry during *Kharif* season of 2012-13 to 2016-17. The rhizomes were treated with redomil @ 3 g/l and *Trichoderma viride* 8g/l of water to prevent diseases. All recommended package of practices were followed timely to grow healthy crop.

The treatment details are pre-emergence application of pendimethalin @1.5 kg a.i./ha at 2 DAS (T_1), pre-emergence application of oxyflurofen @0.3 kg a.i./ha at 2 DAS (T_2), pre-emergence application of pendimethalin @1.5 kg a.i./ha at 2 DAS + post-emergence application of quazilofop ethyl @ 0.05 kg a.i./ha at 30 DAS (T_3), pre-emergence application of pendimethalin @1.5 kg a.i./ha at 2 DAS + post-emergence application of propaquizafop @ 0.05 kg a.i./ha at 30 DAS (T_4), pre-emergence application of oxyflurofen @0.3 kg a.i./ha at 2 DAS + post-emergence application of quazilofop ethyl @ 0.05 kg a.i./ha at 30 DAS (T_5), pre-emergence application of oxyflurofen @0.3 kg a.i./ha at 2 DAS + post-emergence application of propaquizafop @ 0.05 kg a.i./ha at 30 DAS (T_6), pre-emergence application of pendimethalin @1.5 kg a.i./ha at 2 DAS + post-emergence application of quazilofop ethyl @ 0.05 kg a.i./ha at 30 DAS + hand weeding at 90 DAS (T_7), pre-emergence application of pendimethalin @1.5 kg a.i./ha at 2 DAS + post-emergence application of propaquizafop @ 0.05 kg a.i./ha at 30 DAS + hand weeding at 90 DAS (T_8), pre-emergence application of oxyflurofen @0.3 kg a.i./ha at 2 DAS + post-emergence application of quazilofop ethyl @ 0.05 kg a.i./ha at 30 DAS + hand weeding at 90 DAS (T_9), pre-emergence application of oxyflurofen @0.3 kg a.i./ha at 2 DAS + post-emergence application of propaquizafop @ 0.05 kg a.i./ha at 30 DAS + hand weeding at 90 DAS (T_{10}), un weeded control (T_{11}) and weed free check (Regular Hand weeding) (T_{12}). The herbicides were sprayed as per the treatment, using a spray volume of 500 L/hectare. Data for individual years was pooled and statistically analyzed. The economics was worked out based on the total cost of cultivation of ginger in the tribal area of Visakhapatnam.

Results and Discussion

A total of 10 weed species belonging to 9 families were identified as dominant weed flora in the experimental fields during 2012-13 to 2016-17 (Table 1). All these perennial and annul weed species were abundantly growing in the experimental site. These species are highly competitive for essential growth requirements such as nutrients, moisture and light and are also too difficult to control once they are established in the field.

No crop injury was observed with the herbicides applied under study. Plant height, number of tillers, yield per plot, yield per hectare and weed biomass yields were significantly influenced by the weed management treatments (Table 2). The integrated application of pre and post emergence herbicides followed by hand weeding treatments recorded significantly higher yields than pre-emergence application of herbicides only. Among the integrated treatments, pre-emergence application of oxyflourfen 0.30 kg/ha followed by post emergence application of quizalofop ethyl 0.05 kg/ha followed by weeding at 90 DAS recorded the high fresh rhizome yield (22.36 t/ha), which was on a par with weed free check *i.e.* hand weeding at 30, 60, 90, 120 DAS. The increased yield in these treatments can be attributed to season long effective control of weeds in the early stage by pre emergence herbicide and sequential weedings and post emergence herbicides effect at later stages. Un-weeded check recorded the lowest yield (2.68 t/ha) with a yield loss of 88% compared to weed free check. These findings are in line with Eshetu and Addisu (2015) [1] and Dineshsah, *et al,* (2017) in ginger and Ratnam *et al*., (2012) [6] in turmeric.

Economics

The economics was worked out based on the total cost of cultivation including cost of herbicides and harvesting charges in the high altitude and tribal area of Visakhapatnam, Andhra Pradesh. Among the weed management treatments, the highest benefit: cost ratio of (2.96:1) was recorded with pre-emergence application of oxyflourfen @ 0.30 kg/ha followed by post-emergence application of quizalofop ethyl @ 0.05 kg/ha and hand weedings at 90 DAS owing to lower cost of cultivation and higher yield. The treatment weed free check (T_{12}) *i.e.* hand weeding at 30, 60, 90 and DAS which recorded B:C ratio of 2.55:1. The weedy check resulted in negative net returns and B:C ratio (0.67:1) due to lower yields.

Conclusions

The present study has clearly demonstrated that ginger responded well for hand weeding that as weeding frequency increased yield of ginger also increased. From the five years study it was concluded that pre emergence application of oxyflurofen 0.30 kg/ha at 2 days after sowing followed by post emergence application of quazilophop ethyl 0.05 kg/ha at 30 days after sowing followed by hand weeding at 90 days of crop stage is effective and economical for weed management in ginger crop.

Table 1: List of the major weed species identified in ginger field at HRS, Chintapalli

Weed Species (Botanical Name)	Family	Life form
Cynodon doctylon	Poaceae	Perennial
Cyperus rotundus	Cyperaceae	Perennial
Phyllanthus niruri	Phyllanthaceae	Perennial
Oxalis latifolia	Oxalidaceae	Perennial
Solanum nigram	Solanaceae	Perennial
Physalis minima	Solanaceae	Perennial
Mimosa pudica	Fabaceae	Perennial
Commelina benghalensis	Commelinacea	Annual
Euphorbia hirta	Euphobiaceae	Annual
Ageratum conyzoides	Compositea	Annual

Table 2: Effect of different weed management treatments on yield and yield parameters in ginger (Pooled data over five years)

Treatments	Dose (kg/ha)	Time of Application (DAS)	Plant Helght	No. of Tillers	Yield/ plant	Yield/ha	Weed Biomass	B:C ratio
T1	1.50	2	26.34	7.59	123.52	5.98	194.96	1.07:1
T2	0.30	2	27.95	8.83	138.43	7.31	169.86	1.44:1
T3	1.5 + 0.005	2, 30	29.89	10.84	144.96	9.79	149.05	1.87:1
T4	1.5 + 0.005	2, 30	31.07	10.41	164.83	9.39	227.67	1.91:1
T5	0.30+0.05	2, 30	34.93	13.88	249.49	13.24	219.27	2.76:1
T6	0.30+0.05	2, 30	34.67	13.40	226.31	10.65	276.49	1.92:1
T7		2, 30, 90	38.86	16.85	334.30	15.93	295.95	2.45:1
T8		2, 30, 90	37.03	14.63	324.97	15.99	106.84	2.70:1
T9		2, 30, 90	45.14	17.37	439.67	22.36	93.17	2.96:1
T10		2, 30, 90	40.812	15.83	388.97	19.12	98.67	2.88:1
T11	-	-	20.81	2.87	59.41	2.68	380.85	0.67:1
T12	-	30, 60, 90,120	45.37	18.12	452.82	23.28	23.61	2.55:1
Se(m)			0.58	0.47	15.59	0.69	4.9	
CD			1.66	0.66	44.59	1.98	14.02	

References

1. Eshetu T, Addisu M. Effect of weed management methods on the growth and yield of ginger in Jimma, Ethiopia. Journal of Biology, Agriculture and Healthcare. 5(13):200-204.
2. Dinesh Sah, Heisnam P, Mahato NK, Pandey AK. Weed Management in Ginger (*Zingiber officinale* Roscoe) through Integrated Approaches. International Journal of Current Microbiology and Applied Sciences. 2017; 6(10):1839-1845.
3. KAU (Kerala Agricultural University). Annaul Report of the AICRP on weed control. Kerala Agricultural University, Vellanikkara, Thrissur. 2006, pp.16.
4. Mohanthy DC, Naik BS, Dash DK, Sarma YN, Panda BS. A genetic resource and their evaluation in ginger. Indian Journal Plant Genetic Resources. 1990; 3(8):16-18.
5. National Horticulture Board, Indian Horticulture Database. Ministry of Agriculture & Farmers Welfare, Government of India, Gurgaon, 2017.
6. Ratnam M, Rao AS, Reddy TY. Integrated weed management in turmeric (*Curcuma longa*). Indian Journal of Agronomy. 2012; 57(1):82-84.
7. Rekha BK, Raju MS, Reddy MD. Effect of herbicides on weed growth, grain yield and nutrient uptake in rainfed lowland rice. Indian Journal Weed Science. 2003; 35:121-122.
8. Unamma CPA, Emyimmia J, Emezie JE. Critical period of weed interference in cocoyam/maize/sweeet potato. Tropical Pest Management. 1984; 31:21-23.