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Integrated weed management in ginger (*Zingiber officinale* Roscoe)

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Abstract

A field experiment was conducted at Birsa Agricultural University, Ranchi during Kharif season of 2014-15 and 2015-16. The treatments comprised of pendimethalin @ 1.5 kg/ha after planting but before mulching (T1), oxyfluorfen @ 0.20 kg/ha after planting but before mulching (T2), T1+ 1 hand weeding before mulching (T3), T2 + 1 hand weeding before mulching (T4), glyphosate 0.80 kg/ha just before emergence of sprouts of ginger (T5), glyphosate 0.80 kg/ha + pendimethalin 1.5 kg/ha just before emergence of sprouts of ginger (T6), glyphosate 0.80 kg/ha + Oxyfluorfen 0.2 kg/ha just before emergence of sprouts of ginger (T7), Hand weeding at 25 and 50 DAS (T8) and unweeded control (T9). The result revealed that total weeds and their dry matter accumulation were significantly controlled by glyphosate 0.80 kg/ha + oxyfluorfen 0.2 kg/ha applied just before emergence of sprouts of ginger having highest weed control efficiency (90%) as it controlled weeds effectively than rest of the treatments and recorded maximum ginger rhizome yield (29 t/ha), net return (₹9,52,230/-) and B:C ratio (4.59).

Keywords: Ginger rhizome, weed control efficiency, herbicide

Introduction

Ginger a herbaceous perennial root crop, belonging to family Zingiberaceae propagated by rhizomes is the most important spice all over the world. Historically, ginger has a long tradition of being very effective in alleviating symptoms of gastrointestinal distress. Ginger is important spice crop of India and accounts for 45 % of the world's ginger production. Mainly grown in Kerala and on very small area in Karnataka, Tamil Nadu, West Bengal, Bihar, Himachal Pradesh, Uttar Pradesh and Maharashtra. Area under cultivation in India is about 63,000. Ha with total production of about 2 lakh tones. The average productivity is about 3 tones/ha. Among different production factors the major constraint in the production of ginger is labour shortage, infestation by large number of weeds and high incidence of pests and diseases. Ginger crop is highly susceptible to weed competition especially in the initial stages of crop growth. In most cases weed management accounts for the major share of the total cost of cultivation. As the crop receives a high amount of external nutrition coupled with initial slow growth, conditions favour weed emergence which later compete with the crop for moisture, nutrients, space and sun light. Ginger is slow growing and for germination it takes about more than one month. By that time different species of weeds cover up crop restricting growth and development of ginger. Very little work on weed management in ginger has been done. Little work on weed control through soil solarization and use of mulch has been reported by several workers Vilasini (1996) ^[1], (Anaith *et al.*, 2000) ^[2], Mohanty (1977) ^[3], but they are too expensive, however, reports on integrated weed management involving manual, mulch and chemical method of weed control is lacking. Hence, an effort was done to find out effect of weed control measures on productivity and profitability of ginger.

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Material and Methods

A field experiment was conducted at Birsa Agricultural University, Ranchi during *Kharif* season of 2015 to find out the effect of integrated weed management in ginger. The treatments comprised of pendimethalin @ 1.5 kg/ha after planting but before mulching (T1), oxyfluorfen @ 0.20 kg/ha after planting but before mulching (T2), T₁+ 1 hand weeding before mulching (T3), T₂+ 1 hand weeding before mulching (T4), glyphosate 0.80 kg/ha just before emergence of sprouts of ginger (T5), glyphosate 0.80 kg/ha + pendimethalin 1.5 kg/ha just before emergence of sprouts of ginger (T6), glyphosate 0.80 kg/ha + Oxyfluorfen 0.2 kg/ha just before emergence of sprouts of ginger T7, Hand weedings (25 and 50 DAS) (T8) and unweeded control (T9). The treatments were replicated three times. The experimental soil was low in nitrogen (125 kg/ha) and phosphorus (19 kg/ha) and medium in potash (187 kg/ha). The pH of soil was 6.2 and the organic carbon was 0.34%. The crop was sown on 16.06.15. The crop is still in the field and will be harvested in the month of February, 2016.

Results and discussion

Pooled data revealed that grassy, broad leaved weeds and sedges as well as total weeds and their dry matter accumulation were significantly controlled by glyphosate 0.80 kg/ha + oxyfluorfen 0.2 kg/ha applied just before emergence of sprouts of ginger (T7), similar to application of pendimethalin @ 1.5 kg/ha after planting but before mulching + 1 hand weeding before mulching (T3), oxyfluorfen @ 0.20 kg/ha after planting but before mulching + 1 hand weeding before mulching (T4) and hand weedings (25 and 50 DAS) (T8) at 30 and 75 DAS.

Weed control efficiency: Glyphosate 0.80 kg/ha + oxyfluorfen 0.2 kg/ha applied just before emergence of sprouts of ginger (T7) recorded highest weed control efficiency as it controlled weeds effectively than rest of the treatments.

Yield and economics: Application of glyphosate 0.80 kg/ha + oxyfluorfen 0.2 kg/ha applied just before emergence of sprouts of ginger (T7) similar to hand weeding (25 and 50 DAS) (T8) (Table WS 3.3.3.10) recorded maximum ginger rhizome yield (29 t/ha), net return (₹9, 52,230/-) and B: C ratio (4.59).

Table 1: Effect of weed control methods on weed density in ginger (Pooled 2014-15 and 2015-16)

Treatments	Weed density (no./m ²)				Weed density (no./m ²)			
	30 DAS				75 DAS			
	Grassy	BLW	Sedges	Total	Grassy	BLW	Sedges	Total
T ₁ Pendimethalin	7.06 (49)	6.03 (36)	4.25 (18)	10.16 (103)	6.00 (36)	7.10 (50)	4.87 (23)	10.45 (109)
T ₂ Oxyfluorfen	4.22 (18)	4.62 (21)	3.34 (11)	7.04 (49)	3.95 (16)	5.41 (29)	3.83 (14)	7.68 (59)
T ₃ Pendimethalin <i>fb</i> hand weeding	3.10 (9)	3.58 (12)	2.50 (6)	5.26 (27)	2.87 (8)	4.22 (18)	2.83 (8)	5.76 (33)
T ₄ Oxyfluorfen <i>fb</i> hand weeding	3.36 (11)	3.30 (10)	2.47 (6)	5.24 (27)	3.02 (9)	3.92 (15)	2.73 (7)	5.59 (31)
T ₅ Glyphosate	5.45 (29)	4.79 (23)	4.52 (20)	8.50 (72)	5.05 (25)	5.58 (31)	5.18 (26)	9.11 (83)
T ₆ Glyphosate+ pendimethalin	4.69 (22)	5.17 (26)	3.33 (11)	7.67 (59)	4.16 (17)	6.10 (37)	3.82 (14)	8.26 (68)
T ₇ Glyphosate + oxyfluorfen	2.64 (7)	3.29 (10)	2.33 (5)	4.74 (22)	2.48 (6)	3.77 (14)	2.66 (7)	5.18 (26)
T ₈ Hand weeding (2)	3.20 (10)	2.97 (8)	2.56 (6)	4.98 (24)	2.86 (8)	3.49 (12)	2.78 (8)	5.27 (27)
T ₉ Un-weeded control	10.33 (106)	8.89 (79)	6.16 (38)	14.93 (223)	8.77 (77)	10.45 (109)	7.07 (50)	15.34 (235)
SEm±	0.28	0.27	0.22	0.34	0.28	0.39	0.32	0.42
CD (P=0.05)	0.83	0.81	0.67	1.02	0.83	1.16	0.95	1.25
CV%	9.85	9.90	11.03	7.74	11.01	12.10	13.76	8.98

Table 2: Effect of weed control methods on dry matter accumulation by weeds and weed control efficiency (Pooled of 2014-15 and 2015-16)

Treatments	Weed dry weight (g./m ²)		Weed control efficiency (%)	
	30 DAS	75 DAS	30 DAS	75 DAS
	T ₁ Pendimethalin	6.75 (45)	7.99 (63)	52.77
T ₂ Oxyfluorfen	4.80 (23)	5.62 (31)	76.20	76.70
T ₃ Pendimethalin <i>fb</i> hand weeding	3.46 (12)	4.22 (17)	88.08	87.45
T ₄ Oxyfluorfen <i>fb</i> hand weeding	3.49 (12)	4.18 (17)	87.85	87.59
T ₅ Glyphosate	5.60 (31)	6.68 (44)	67.68	67.50
T ₆ Glyphosate+ pendimethalin	5.11 (26)	6.08 (37)	72.70	73.06
T ₇ Glyphosate + oxyfluorfen	3.17 (10)	3.74 (13)	90.11	90.10
T ₈ Hand weeding (2)	3.28 (10)	3.92 (15)	89.24	89.12
T ₉ Un-weeded control	9.85 (97)	11.71 (137)	0.00	0.00
SEm±	0.24	0.28		
CD (P=0.05)	0.72	0.85		
CV%	8.25	8.17		

Table 3: Effect of weed control methods yield and economics of ginger (2014-15, 2015-16 and pool of two years)

Treatments	Yield (t/ha)			Cost of cultivation (₹/ha)	Net return (₹/ha)			B: C ratio		
	2014-15	2015-16	Pool		2014-15	2015-16	Pool	2014-15	2015-16	Pool
T ₁ Pendimethalin	10.88	9.10	9.99	207627	227373	156373	191873	2.41	0.75	0.92
T ₂ Oxyfluorfen	18.00	15.29	16.65	206755	513245	405025	459135	4.68	1.96	2.22
T ₃ Pendimethalin <i>fb</i> hand weeding	25.31	21.67	23.49	210284	802216	656383	729300	6.77	3.12	3.47
T ₄ Oxyfluorfen <i>fb</i> hand weeding	24.38	20.88	22.63	209411	765589	625839	695714	6.53	2.99	3.32
T ₅ Glyphosate	16.50	14.08	15.29	205659	454341	357675	406008	4.25	1.74	1.97

T ₆	Glyphosate+ pendimethalin	16.88	14.49	15.68	208359	466641	371225	418933	4.26	1.78	2.01
T ₇	Glyphosate + oxyfluorfen	31.00	26.99	28.99	207486	1032514	871947	952230	8.73	4.20	4.59
T ₈	Hand weeding (2)	26.63	22.87	24.75	213427	851573	701383	776478	6.98	3.29	3.64
T ₉	Un-weeded control	3.38	3.61	3.49	204573	-69573	-60143	-64858	0.08	-0.29	-0.32
	SEm±	3.18	1.58	2.26		127346	63154	90376	1.00	0.30	0.44
	CD (P=0.05)	9.54	4.73	6.77		381743	189315	270917	3.01	0.91	1.31

Selling price of ginger ₹40/-kg)

Conclusion

From the two years findings it can be inferred that glyphosate 0.80 kg/ha + oxyfluorfen 0.2 kg/ha applied just before emergence of sprouts of ginger (T₇) was more effective in controlling weeds (weed control efficiency 90%) of ginger in all the growth stages of ginger as a result it produced maximum ginger rhizome yield (29 t/ha), net return (₹ 9, 52,230/-) and B: C ratio (4.59).

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