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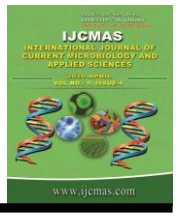

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Effect of Weed Management Practices on Growth and Yield of Summer Groundnut (*Arachis hypogaea* L.) in Red and Lateritic Soil

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A B S T R A C T

A field experiment was conducted during the summer seasons of 2018 at Agricultural Farm, Institute of Agriculture, Visva-Bharati, Sriniketan, West Bengal to study the effect of pre-emergance herbicide on growth, yield attributes and yield of summer groundnut (*Arachis hypogaea* L.). The experiment comprising of eight treatments was laid out in a randomized block design with three replications. Application of Flumioxazin 50% SL 150 g a.i ha^{-1} at 1 DAS resulted significantly higher plant height (95.33 cm), leaf area index at 60 DAS (1.8), no. of branches/plant at 60 DAS (17.33), dry matter accumulation at harvest (611.60 g m^{-2}), no. of mature pods/plant (17.82), pod yield (3199.33 kg ha^{-1}), haulm yield (3155.73 kg ha^{-1}), harvest index (50.37 %), shelling percentage (71%) and minimum no. of immature pods/plant (1.27) over untreated control but was at par with Flumioxazin 50% SL 125 g a.i ha^{-1} at 1 DAS and weed free check.

Introduction

Oil seed crops have a vital role in industry of Indian Agriculture. Groundnut (*Arachis hypogaea L.*) is also known as peanut, earthnut, monkeynut and goobers. It has reserved its position due to its both domestic and export markets importance being the fourth most important oilseed crop and second most important source of vegetable oil in the world (Guchi, 2015; Kombiok *et al*., 2012). In our country, weeds are one of the important factors responsible for low yield of groundnut.

Weeds reduce yields by competing with the groundnut plant for resources, such as sunlight, space, moisture, and nutrients (Upadhyay, 1984) not only throughout the growing season, but also create problem during digging and inverting procedures and reduce harvesting efficiency.

Harvesting losses increases as the biomass of weeds slow down the field-drying of groundnut vines and pods and increases the possibility of exposure to rainfall. Weeds have allellopathic effect with groundnut (Bansal, 1993) and they act as host for causal organisms of various diseases and insect pests.

In the initial growth of crop there is relatively shallow canopy and it slowly shades the inter-row area, which allows bumper weeds growth and thus groundnut crop becomes more susceptible to weed crop competition in the earlier growth period of the crop.

Therefore, according to Wesley *et al.*, (2008) the critical period of grass weed control was found to be from four to nine weeks after planting whereas, the critical period of broad leaved weeds control was from two to eight weeks. Zimdhal (2004) reported that Groundnut yield decreased with increasing time of weed interference with all type of weed species.

According to Walia *et al*., (2007), there is an urgent need to explore the possibilities for increasing the productivity better understanding of the constraints in production of oilseed crops especially in groundnut. Since manual weeding requires manpower and it is time consuming, herbicides are the most effective and economic weed control measures.

In view of the above facts, the present investigation was attempted on weed management practices to identify effective and economically viable weed control method through evaluating the performance of pre- emergence herbicides in groundnut by comparing their relative effect with weed free condition for augmenting the productivity of groundnut crop and harvesting higher yield.

Materials and Methods

A field experiment was conducted under red and lateritic soils of West Bengal during summer season, 2018 at the Agricultural Farm, Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati, Sriniketan, West-Bengal which is situated an altitude of 59.00 meter above mean sea level and lies at 23º.66'N latitude and 87º.66'E longitude. The total rainfall received during the crop season was 16.6 mm.

The soil of the experimental field was sandy loam with sand (72.6 %), silt (17.8%), clay (9.6%), having pH 5.5, 0.42% organic carbon and 240, 25.54, and 150 kg ha^{-1} available N, P and K respectively. Eight treatment combinations *viz.*, Flumioxazin 50% SL 75 g a.i ha^{-1} at 1 DAS, Flumioxazin 50% SL 100 g a.i ha^{-1} at 1 DAS, Flumioxazin 50% SL 125 g a.i ha^{-1} at 1 DAS, Flumioxazin 50% SL 150 g a.i ha^{-1} at 1 DAS, Imazethapyr 10 SL 100 g a.i ha^{-1} at 1 DAS, Pendimethalin 30 % EC 750 g a.i ha^{-1} at 1 DAS, Untreated control and weed free check were tested in a Randomized Block Design with three replications. The groundnut variety, Tag-24 was sown on 25th of February 2018 in row 30 cm apart using seed rate of 120 kg ha^{-1} in a plot measuring 12 m^{-2}.

Seeds were treated with carbendazim to avoid the possible occurrence of the seed and soil borne diseases. The recommended dose of fertilizers (N: P_2O_5: K_2O-20: 40: 60 kg ha^{-1} as Urea, SSP and MOP) applied as basal prior to sowing. Flumioxazin, Pendimethalin and Imazethapyr were applied next day of sowing as per treatment. The herbicide spraying was done with flat fan nozzle. Four irrigations were given during the crop growing period.

Five plants were randomly selected from each plot giving off the border row for recording observation on growth parameter. A treatment

wise sample of 500 g of pods was shelled and weight of kernels was recorded and shelling percentage was calculated by the following formula:

Shelling percentage (%) = Weight of kernels (g)/Weight of pods (g) x100

Results and Discussion

Growth attributes

The results revealed that all the weed management practices including weed-free check significantly improved the growth parameters over untreated control (Table 1).

Flumioxazin 50% SL 150 g a.i ha^{-1} at 1 DAS resulted significantly higher plant height, leaf area index, no. of branch/plant and dry matter accumulation over untreated control but was at par with Flumioxazin 50% SL 125 g a.i ha^{-1} at 1 DAS and weed free check at all the stages of growth.

At the initially (Since, Summer groundnut crop is slow growth rate up to 45 days after sowing due to low atmospheric temperature therefore crop is severely affected by weeds in the initial stage (Mohapatra, 2005) and effective control of weeds is expected to have better availability of moisture, nutrients and solar radiation to the crop plants, thereby increasing total chlorophyll content, photosynthetic rate and nitrate reductase activity (Channappagoudar *et al.*, 2008), leading to higher supply of carbohydrates which resulted in higher increase in growth attributes than untreated control.

Less weed population also provides ample space for root growth and nodulation in groundnut (Devi Dayal, 2004). Growth attributes of groundnut was found lowest throughout the growing period with untreated control due to higher weed infestation and highest crop- weed competition.

Yield attributes and yield

Yields attributes, except 100-seed weight, and yield was significantly affected by weed management practices (Table 2). Flumioxazin 50% SL 150 g a.i ha^{-1} at 1 DAS resulted significantly more no. of mature pods/plant, pod yield, haulm yield, harvest index, shelling percentage and minimum no. of immature pods/plant over untreated control but was at par with Flumioxazin 50% SL 125 g a.i ha^{-1} at 1 DAS and weed free check.

However, highest yield attributes, yield, harvest index and shelling percentage was found with weed free check. These results are in conformity with the findings of Kalhapure (2013).

Weed-free environment facilitates better growth and development of plants, flowering, peg initiation and entry into the soil, pod formation and development, and harvesting which tends to increase mature pods/plant, kernel weight and consequently pod yield/ha.

Treatments recording higher pod yield also recorded higher yield of haulm in the weed free environment. The weed free environment recorded significantly higher harvest index than untreated control condition.

This was probably due to better water and nutrient availability resulting in enhanced sink capacity and higher pod productivity under Flumioxazin 50% SL 150 g a.i ha^{-1} at 1 DAS, Flumioxazin 50% SL 125 g a.i ha^{-1} at 1 DAS and weed free check.

Table.1 Effect of weed management on growth attributes of summer groundnut at various growth stages

Treatments	Plant height (cm) at harvest	Dry matter accumulation (g m^{-2})		No. of branch/ plant at 60 DAS	Leaf Area Index	
		30 DAS	At harvest		30 DAS	60 DAS
Flumioxazin 50% SL 75 g a.i ha^{-1} at 1 DAS	80.00	45.47	574.20	16.33	0.54	1.57
Flumioxazin 50% SL 100 g a.i ha^{-1} at 1 DAS	86.67	49.50	586.03	16.67	0.60	1.69
Flumioxazin 50% SL 125 g a.i ha^{-1} at 1 DAS	94.00	55.73	598.77	17.00	0.72	1.75
Flumioxazin 50% SL 150 g a.i ha^{-1} at 1 DAS	95.33	60.87	611.60	17.33	0.84	1.80
Imazethapyr 10 SL 100 g a.i ha^{-1} at 1 DAS	81.67	42.53	556.23	16.00	0.52	1.51
Pendimethalin 30 % EC 750 g a.i ha^{-1} at 1 DAS	76.00	39.60	521.77	15.67	0.51	1.55
Untreated control	73.67	37.40	453.57	11.33	0.38	1.32
Weed free check	105.67	79.57	640.20	18.33	0.62	1.81
S.Em(±)	3.78	2.65	25.07	1.16	0.03	0.07
CD at 5 %	11.10	8.02	76.03	3.52	0.11	0.21
CV (%)	5.35	8.93	7.65	12.48	9.70	7.71

Table.2 Effect of weed management on yield attributes and yields of summer groundnut

Treatments	No. of mature pods /Plant	No. of immature pods/plant	100 seed weight (g)	Pod yield (kg ha^{-1})	Haulm yield (kg ha^{-1}.)	Harvest index (%)	Shelling (%)
Flumioxazin 50% SL 75 g a.i ha^{-1} at 1 DAS	15.56	1.56	55.99	2087.00	2544.12	45.02	61.27
Flumioxazin 50% SL 100 g a.i ha^{-1} at 1 DAS	16.42	1.47	59.37	2576.00	2743.80	48.39	63.80
Flumioxazin 50% SL 125 g a.i ha^{-1} at 1 DAS	16.68	1.47	60.44	2991.02	2949.18	50.35	65.70
Flumioxazin 50% SL 150 g a.i ha^{-1} at 1 DAS	17.82	1.27	64.84	3199.33	3155.73	50.37	71.00
Imazethapyr 10 SL 100 g a.i ha^{-1} at 1 DAS	12.13	1.93	57.75	2078.43	2746.97	42.69	65.27
Pendimethalin 30 % EC 750 g a.i ha^{-1} at 1 DAS	11.74	2.04	56.81	2033.00	2722.81	42.82	62.13
Untreated control	10.68	2.95	54.58	910.50	1890.04	32.57	60.00
Weed free check	18.61	1.18	66.56	3489.33	3509.54	49.85	72.67
S.Em(±)	0.73	0.08	2.51	100.15	122.98	1.93	2.68
CD at 5 %	2.21	0.26	NS	303.77	362.80	5.89	8.11
CV (%)	8.40	8.18	7.29	7.17	7.66	7.39	7.11

It was found that almost all growth parameters, yield components and yield were significantly influenced by the different weed management practices. The results revealed that when labour is scarce and time consuming, pre-emergence herbicides such Flumioxazon 50 %SL 150 g/ha could be used as effective weed management for higher growth and productivity.

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