



## New Formulation of Oxyfluorfen on Weed Control of Groundnut and its Residual Effect on Succeeding Crops

### KEYWORDS

Crop safety, Groundnut, Herbicide effect, WCE, Yield.

**Sathya Priya Ramalingam**

Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore - 641 003 (Tamil Nadu)

**Manickasundaram Perumal**

Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore - 641 003 (Tamil Nadu)

**Chinnusamy Chinnagounder**

Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore - 641 003 (Tamil Nadu)

**ABSTRACT** A field investigation was carried out at the Agricultural Research Station, Bhavanisagar of Tamil Nadu Agricultural University, during kharif season of 2009 and 2010 to evaluate the new formulation of oxyfluorfen (23.5% EC) on weed control in groundnut and their residual effect on succeeding crops. Based on two years field experimentation, it was found that pre-emergence application of oxyfluorfen (23.5% EC) at 400 g ha<sup>-1</sup> gave significantly lower total weed density and higher weed control efficiency at all the intervals. Application of new formulation of oxyfluorfen (23.5% EC) at 250 g ha<sup>-1</sup> as pre-emergence herbicide can keep the weed density and dry weight below the economic threshold level and increased the yield attributes and pod yield significantly over unweeded control. Succeeding crops like sunflower and pearl millet sown immediately after the harvest of groundnut was not affected by the residue of new formulation of oxyfluorfen at all different doses tested in the experiment.

### Introduction

In India out of total production of edible oil, 67 per cent is contributed by groundnut. The demand for edible oil in the country is rising by 6 per cent per year. Therefore, concerted efforts are now being made for increasing and stabilizing oilseed production. Weeds are considered as a major biotic constraint for high production. Groundnut cannot compete effectively with weeds, particularly 3-6 weeks after sowing and therefore, early removal of weeds is important before flowering and during pegging (Page et al., 2002). Recently, use of herbicides has become popular over manual and mechanical methods, because of the concomitant increase in crop yield. Most of the herbicides are selective and specific to the crop and persist in the soil for few months to a few years depending upon the chemical and concentration used. Bioassay remains a major tool for qualitative and quantitative determination of herbicides residue in soil. Detection of the presence of a herbicide can be done by bioassay which measures the biological response of a living plant to the herbicide (Jayakumar, 1987). Considering above facts, an attempt has been made to study the residual effect of herbicides applied to kharif groundnut on succeeding rabi sunflower and pearl millet crops.

### Materials and Methods

The experiment was laid out in randomized complete block design with three replications and replicated thrice. Treatments consisted of pre-emergence application of already registered oxyfluorfen (goal) at 200 g ha<sup>-1</sup>, new formulation of oxyfluorfen (23.5% EC) at 150, 200, 250, 300 and 400 g ha<sup>-1</sup>, pendimethalin 0.75 kg ha<sup>-1</sup> + Hand weeding on 45 DAS, pendimethalin 0.75 kg ha<sup>-1</sup> + Rotary weeding on 45 DAS, Hand weeding twice on 25 and 45 DAS and unweeded check. The crop was harvested on first week of October during both the years. After harvesting of the groundnut crop to know the residual effect of herbicides, without disturbing the layout of each plot was manually prepared for sowing of succeeding crops. Seven rows of each succeeding sunflower and pearl millet were sown in each plot in rabi season. The germination percentage, plant height, dry weight of plants and yield of sunflower and pearl millet crops were recorded and data were used for analysis.

### Results and Discussion

#### Predominant weed flora in the experimental field

The dominant grassy weed species were *Cynodon dactylon*, *Acrachne racemosa* and *Dactyloctenium aegyptium*. Among the broad leaved weeds *Boerhaavia diffusa*, *Parthenium hysterophorus* and *Digeria arvensis* were the dominant weeds. *Cyperus rotundus* was the only sedge present in the experimental field.

#### Effect on crop

The pod yield of groundnut during kharif 2009 and 2010, was increase with the application of new molecule of oxyfluorfen at 250 g ha<sup>-1</sup> was 8.0 and 8.5 per cent higher over the application of oxyfluorfen at 200 g ha<sup>-1</sup>, 13.3 and 16.1 per cent higher over oxyfluorfen at 400 g ha<sup>-1</sup>, 11.8 and 10.3 per cent higher over hand weeding twice on 25 and 45 DAS. The pre-emergence application of oxyfluorfen at 250 g ha<sup>-1</sup> recorded 59.3 and 55.4 per cent higher pod yield of groundnut over unweeded control. According to the findings of Solanki et al. (2005) the pod and haulm yield of groundnut was higher with pre-emergence application of herbicides due to reduced crop weed competition in early stage than post-emergence application of the same herbicides. Eventhough the weed control efficiency was higher under oxyfluorfen at 300 and 400 g ha<sup>-1</sup> but the yields were lower and the reason might be due to initial phytotoxicity symptoms on groundnut, which resulted in reduced plant population, lesser plant height, leaf area, dry matter production and finally, decreased the pod yield.

#### Bioassay Study

Results revealed that germination of succeeding sunflower and pearl millet recorded at 10 DAS was not significantly affected by residual effect of herbicide applied to irrigated groundnut. Though, the plant stand of sunflower ranged from 84 to 89 per cent and pearl millet from 87 to 94 per cent under all the treatments at 10 DAS. Further, plant height and dry weight of plants recorded at 30, 60 and 90 DAS were also unaffected due to residual effect of different doses of oxyfluorfen applied in groundnut. Yield of sunflower and pearl millet showed no distinct variation due to different dose of oxyfluorfen. To result is in line with the outcome of Jayakumar (2010) reported that, the pre-emergence application of oxyfluorfen in tea at higher doses of 300 and 400 g ha<sup>-1</sup> did not leave any residue in the soil and there was no toxic effect beyond 60 days. It might be showed that the residual toxicity of oxyfluorfen cannot be ruled out on

sensitive crops such as sunflower and pearl millet in rotation.

### Conclusion

From, the study, it can be concluded that the new formulation of oxyfluorfen (23.5% EC) at 150, 200, 250, 300 and 400 g

ha<sup>-1</sup> and oxyfluorfen (goal) at 200 g ha<sup>-1</sup> applied in groundnut was found to be safe on the succeeding crops and this might be due to detoxification of herbicides in soil and do not adversely affect the growth and yield attributes of the succeeding crops.

**Table 1. Effect of weed management methods on weed control efficiency, pod and haulm yield of groundnut**

Treatments	kharif, 2009				kharif, 2010			
	Pod yield (kg ha <sup>-1</sup> )	Haulm yield (kg ha <sup>-1</sup> )	WCE (%)		Pod yield (kg ha <sup>-1</sup> )	Haulm yield (kg ha <sup>-1</sup> )	WCE (%)	
			20 DAS	40 DAS			20 DAS	40 DAS
T <sub>1</sub> - PE oxyfluorfen (Goal) at 200 g a.i ha <sup>-1</sup>	1443	2456	86.01	77.33	1526	2478	86.29	81.32
T <sub>2</sub> - PE oxyfluorfen at 150 g a.i ha <sup>-1</sup>	1523	2584	75.64	70.20	1622	2606	81.73	70.29
T <sub>3</sub> - PE oxyfluorfen at 200 g a.i ha <sup>-1</sup>	1892	2723	83.06	78.89	1868	2745	86.01	80.32
T <sub>4</sub> - PE oxyfluorfen at 250 g a.i ha <sup>-1</sup>	2058	2846	89.02	83.66	2072	2868	90.38	84.05
T <sub>5</sub> - PE oxyfluorfen at 300 g a.i ha <sup>-1</sup>	1706	2521	91.52	86.39	1810	2543	92.55	85.79
T <sub>6</sub> - PE oxyfluorfen at 400 g a.i ha <sup>-1</sup>	1784	2458	93.76	88.90	1713	2480	94.65	88.68
T <sub>7</sub> - Pendi. at 0.75 kg ha <sup>-1</sup> + HW on 45 DAS	1643	2521	82.19	78.83	1792	2583	84.51	76.52
T <sub>8</sub> - Pendi. at 0.75 kg ha <sup>-1</sup> + RW on 45 DAS	1521	2492	80.56	77.35	1618	2414	85.33	76.08
T <sub>9</sub> - HW twice on 25 and 45 DAS	1814	2706	-	82.02	1835	2728	-	82.96
T <sub>10</sub> - Unweeded control	837	1847	-	-	910	1869	-	-
Sed	115	150	-	-	105	154	-	-
CD (P=0.05)	238	307	-	-	214	316	-	-

PE - Pre emergence; HW - Hand weeding

**Table 2. Residual effect of herbicides on the germination (%) and dry matter production (kg ha<sup>-1</sup>) of succeeding crops of groundnut**

Treatments	Sunflower						Pearl millet					
	rabi, 2009			rabi, 2010			rabi, 2009			rabi, 2010		
	Germ (%)	30 DAS	60 DAS	Germ (%)	30 DAS	60 DAS	Germ (%)	30 DAS	60 DAS	Germ (%)	30 DAS	60 DAS
T <sub>1</sub> - PE oxyfluorfen (Goal) at 200 g a.i ha <sup>-1</sup>	66.58 (84.25)	212	1148	64.79 (81.87)	225	1204	72.04 (90.55)	260	2728	71.31 (89.7)	252	2715
T <sub>2</sub> - PE oxyfluorfen at 150 g a.i ha <sup>-1</sup>	69.29 (87.52)	209	1125	68.16 (86.17)	218	1181	74.21 (92.67)	244	2632	69.59 (87.84)	226	2619
T <sub>3</sub> - PE oxyfluorfen at 200 g a.i ha <sup>-1</sup>	69.82 (88.18)	220	1132	67.02 (84.77)	202	1188	75.46 (93.72)	261	2806	74.59 (92.94)	253	2793
T <sub>4</sub> - PE oxyfluorfen at 250 g a.i ha <sup>-1</sup>	66.78 (85.77)	233	1168	68.33 (86.37)	225	1224	72.34 (90.89)	274	2823	70.66 (89.04)	246	2810
T <sub>5</sub> - PE oxyfluorfen at 300 g a.i ha <sup>-1</sup>	71.19 (89.62)	238	1152	68.26 (86.27)	245	1208	76.06 (94.23)	287	2954	75.15 (93.44)	279	2941
T <sub>6</sub> - PE oxyfluorfen at 400 g a.i ha <sup>-1</sup>	69.47 (87.70)	226	1144	66.71 (84.37)	218	1200	73.67 (92.18)	265	2797	70.03 (88.34)	277	2784
T <sub>7</sub> - Pendi. at 0.75 kg ha <sup>-1</sup> + HW on 45 DAS	70.18 (88.52)	215	1130	67.35 (85.17)	227	1186	73.58 (92.33)	258	2688	73.09 (91.54)	250	2675
T <sub>8</sub> - Pendi. at 0.75 kg ha <sup>-1</sup> + RW on 45 DAS	66.66 (84.35)	198	1125	65.62 (82.97)	208	1181	75.46 (93.72)	245	2756	71.50 (89.94)	257	2743
T <sub>9</sub> - HW twice on 25 and 45 DAS	70.35 (88.72)	230	1159	67.5 (85.37)	232	1215	76.81 (94.87)	272	2802	74.70 (93.04)	264	2789
T <sub>10</sub> - Unweeded control	68.95 (87.19)	217	1148	66.24 (83.77)	229	1204	73.78 (92.22)	268	2917	72.98 (91.44)	278	2904
SEd	8.9	26	133	6.3	29	126	9.6	29	293	7.3	33	288
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Figures in parthesis are arc sin transformed values; Germ Germination; PE - Pre emergence; HW - Hand weedin

Table 3. Residual effect of herbicides on yield (kg ha<sup>-1</sup>) of succeeding crops of groundnut

Treatments	Sunflower				Pearl millet			
	rabi, 2009		rabi, 2010		rabi, 2009		rabi, 2010	
	Grain	Stalk	Grain	Stalk	Grain	Stover	Grain	Stover
T <sub>1</sub> - PE oxyfluorfen (Goal) at 200 g a.i ha <sup>-1</sup>	938	923	924	935	715	2658	722	2645
T <sub>2</sub> - PE oxyfluorfen at 150 g a.i ha <sup>-1</sup>	871	817	857	829	674	2578	661	2555
T <sub>3</sub> - PE oxyfluorfen at 200 g a.i ha <sup>-1</sup>	958	988	944	1000	688	2765	695	2752
T <sub>4</sub> - PE oxyfluorfen at 250 g a.i ha <sup>-1</sup>	984	972	970	999	728	2948	745	2925
T <sub>5</sub> - PE oxyfluorfen at 300 g a.i ha <sup>-1</sup>	968	1003	954	1015	736	2847	743	2824
T <sub>6</sub> - PE oxyfluorfen at 400 g a.i ha <sup>-1</sup>	892	974	878	989	665	2694	692	2681
T <sub>7</sub> - Pendi. at 0.75 kg ha <sup>-1</sup> + HW on 45 DAS	932	894	918	906	712	2624	729	2611
T <sub>8</sub> - Pendi. at 0.75 kg ha <sup>-1</sup> + RW on 45 DAS	894	937	880	929	677	2532	694	209
T <sub>9</sub> - HW twice on 25 and 45 DAS	889	956	875	978	717	2678	724	2655
T <sub>10</sub> - Unweeded control	917	910	903	932	698	2894	715	2881
SEd	62	112	58	125	72	287	79	294
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS

PE - Pre emergence; HW - Hand weeding

## REFERENCE

- Jayakumar, B. 2010. Efficiency evaluation of oxyfluorfen on weed control in tea and its residual effect on succeeding crop. M.Sc. Thesis, Tamil Nadu Agric. Univ., Coimbatore, Tamil Nadu, India. | Jayakumar, R., 1987. Bioassay for detection certain herbicide residue in soils. Madras agric. J. 74: 267-272. | Page, W.W., C.M. Busolo-Bulapu, P.J.A. Vander and T.C.S. Chancellor. 2002. Recommended groundnut production practices for smallholder farmers in Uganda. University of Greenwich, Greenwich, London, SE10 9LS. | Solanki, R.M., V.B. Bhalu, K.V. Jadav and G.R. Kelaia. 2005. Studies on integrated weed management in irrigated groundnut. Ind. J. Weed Sci., 37 (1&2): 119-120. |