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Effect of different herbicides and cultural practices on weeds and yield of irrigated groundnut

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Abstract
A field experiment was conducted at farmer's field, Aladi village, Vridhachalam Taluk, Cuddalore District of Tamil Nadu, to study the effect of different herbicides and cultural practices in irrigated groundnut. The experiment was laid out in Randomised block design with three replications. The treatment comprised of T_1 - Unweeded control, T_2 - Two hand weeding at 15 DAS and 30 DAS, T_3 -Pre emergence application of pendimethalin @ 1.0 kg ha^{-1} followed by hand weeding on 30 DAS, T_4 - Pre emergence application of oxyfluorfen @ 250g ha^{-1} followed by hand weeding on 30 DAS, T_5 - Post emergence application of imazethapyr @ 100 g ha^{-1} on 15 DAS, T_6 -Post emergence application of quizalofop-p-ethyl @ 50 g ha^{-1} on 15 DAS, T_7 - Pre emergence application of pendimethalin @ 1.0 kg ha^{-1} at 3 DAS followed by post emergence application of imazethapyr @ 100g ha^{-1}at 15 DAS,T_8 - Pre emergence application ofoxyfluorfen @250 g ha^{-1} followed by post emergence application of imazethapyr @ 100 g ha^{-1} at 15 DAS, T_9 - Pre emergence application of pendimethalin @ 1.0kg ha^{-1} followed by post emergence applicationof quizalofop-p-ethyl @ 50 g ha^{-1} at 15 DAS, T_{10} -Pre emergence application ofoxyfluorfen @250 g ha^{-1} at 3 DAS followed by post emergence application of quizalofop-p-ethyl @ 50 g ha^{-1} at 15 DAS, T_{11} - Post emergence application of imazethapyr @ 100 g ha^{-1} at 15 DAS followed by hand weeding at 30 DAS, T_{12} - Post emergence application of quizalofop-p-ethyl @ 50 g ha^{-1} at 15 DAS followed byhand weeding at 30 DAS. Among the weed management practices, pre-emergence application of Pendimethalin @ 1.0 Kg ha $^{-1}$ followed by hand weeding at 30 DAS significantly lowered the total weed population, weed dry matter production and provide higher weed control efficiency at all intervals and it was followed by two hand weeding at 15 and 30 DAS. The yield attributes of groundnut and pod yield were increased under applications of Pendimethalin @ 1.0 Kg ha $^{-1}$ followed by hand weeding at 30 DAS Unweeded control had accounted for lower pod yield higher weed index due to heavy competition of weeds.

Keywords: xxxx

Introduction
India is one of the largest producers of oil seed crop in the world and has achieved self-sufficiency in oilseed production. Groundnut is the major oilseed crop and widely grown all over India. Groundnut is also known as poor man's cashew and wonder nut. The national average productivity of groundnut is 1040 kg ha $^{-1}$ in India which was less than the world average of 1600 kg ha $^{-1}$ (Malunjkar *et al*., 2012) [2]. In Tamil Nadu, groundnut is cultivated in an area of 11 lakh hectares with an average productivity of 1713 kg ha^{-1} (FAT-1999). Though, the yield level is 60 and 25 per cent increase over national and global average, the scope for further improvement in yield with present day high yielding varieties are promising. Among them, many fold losses caused by weed is of serious nature.

Weeds compete with crop for nutrients, soil moisture and sunlight and reduce the crop yields. Computational stress of weeds exerts reduction in pod yield to the extent of 17-84% (Nambi and Sundari., 2008) [3]. Critical period of crop weed competition for groundnut crop was reported to be up to 45 DAS Favourable temperature, light and moisture available to crop, also permit rapid multiplication of weeds at the early stages and posses competition to groundnut crop on the other hand. Weeds not only compete with crop for the resources but also interfere with pegging, pod development and harvesting of groundnut. Growing urbanization, diversification of agriculture and various welfare introduced by the government aimed at improving rural mass are seriously affecting the availability of labour for farm operation. Due to unavailability of labour, most farmers do not accord high priority to weed control and management. Traditional method of hand hoeing in addition to being expensive and time consuming is ineffective in controlling these weed seeds germinate after every hoeing.

Herbicides are the most successful weed control method ever developed. No doubt weed control through chemical is easy, economical and labour efficient, the over dependence resulted in some serious environmental and ecological implications and continuous use of herbicides for weed control leads to residue hazards, weed shift and buildup of resistance in

weed. In order to minimize the losses caused by weeds some new herbicides suitable for groundnut has been developed. In these conditions herbicides in combination with cultural practices offers economically suitable and effective weed control in groundnut, Therefore, the present investigation was carried out to search the appropriate weed management practice for groundnut.

Materials and Methods

The field experiment was carried out at farmer's field, Aladi village, Vridhachalam Taluk, Cuddalore District of Tamil Nadu during *kharif* season. The soil of the experimental field was sandy loam clay in texture with pH of 6.5 and low, medium and high N, P_2O_5 and K_2Orespectively.30The experiment was laid out in Randomised block design with three replications. The treatments consist of T_1 - Unweeded control, T_2 - Two hand weeding at 15 DAS and 30 DAS, T_3 - Pre emergence application of pendimethalin @ 1.0 kg ha^{-1} followed by hand weeding on 30 DAS, T_4 - Pre emergence application of oxyfluorfen @ 250g ha^{-1} followed by hand weeding on 30 DAS, T_5 - Post emergence application of imazethapyr @ 100 g ha^{-1} on 15 DAS, T_6 -Post emergence application of quizalofop-p-ethyl @ 50 g ha^{-1} on 15 DAS, T_7 - Pre emergence application ofpendimethalin @ 1.0 kg ha^{-1} at 3 DAS followed by post emergence application of imazethapyr @ 100g ha^{-1}at 15 DAS,T_8 - Pre emergence application ofoxyfluorfen @250 g ha^{-1} followed by post emergence application of imazethapyr @ 100 g ha^{-1} at 15 DAS, T_9 - Pre emergence application ofpendimethalin @ 1.0kg ha^{-1} followed by post emergence applicationof quizalofop-p-ethyl @ 50 g ha^{-1} at 15 DAS, T_{10} -Pre emergence application ofoxyfluorfen @250 g ha^{-1} at 3 DAS followed by post emergence application of quizalofop-p-ethyl @ 50 g ha^{-1} at 15 DAS, T_{11} - Post emergence application of imazethapyr @ 100 g ha^{-1} at 15 DAS followed by hand weeding at 30 DAS, T_{12} - Post emergence application ofquizalofop-p-ethyl @ 50 g ha^{-1} at 15 DAS followed byhand weeding at 30 DAS. Crop variety VRI 2 was used as the test crop during *kharif* season for the study Pre- emergence application of pendimethalin and oxyflourfen were applied to the respective plots on 3rd day after sowing and then irrigated. Post emergence herbicide imazethapyr and quizalofop ethyl was applied on 15th day after sowing with knapsack sprayer fitted with flat fan nozzle using 500 litres of water per hector. Hand weeding on 15th and 30th day was done as per the treatment.

Result and Discussion

The predominant weed observed in the experiment field were *Cynodon dactylon, Dactyloctenium aegyptium, Panicum repens, Echinochola colonum* among the grasses *Cleome gynandra, Cleome viscosa, Phyllanthus niruri, Boerhaavia diffusa, Eclipta alba* among the broad leaf weeds and *Cyperus rotundus* among the sedges.

Effect of treatment on weeds

Weed management practices significantly influenced on grasses, broadleaved weeds, sedges and total weed density. Herbicides treatments recorded lower weed density at 15 DAS than hand weeding and unweeded control. The highest weed density was observed with pre- emergence application of Pendimethalin1.0 Kg ha^{-1} followed by hand weeding on 30 DAS. It was followed by two hand weeding on15and 30 DAS and it was on par with pre- emergence application of pendimethalin @ 1.0 Kg ha^{-1} followed by post emergence application of imazethapyr The reduction in grass, sedges, broad leaved weeds and total weed density were observed with pre emergence application of pendimethalin @ 1.0 kg ha^{-1} on 3 DAS + Hand weeding on 30 DAS was due to efficient control of weeds by application of pendimethalin followed by hand weedig. This findings are in concurrence with those of Nambiand Sundari (2008) [3] and Patro *et al., (*2014) [4].

Weed control efficiency indicates the magnitude of effective reduction of weed density by weed management practices. Pre-emergence application of pendimethalin @ 1.0 kg ha^{-1} on 3 DAS + Hand weeding on 30 DAS recorded higher weed control efficiency. More reducing in total weed density resulted in higher WCE. Pendimethalin a selective herbicide, it controlled the emerging weeds very effectively and subsequently reduced the weed density. These results corroborate the finds of Vaddi *et al.,* (2001).

Effect of treatments on crop

The treatment did not statistically significant in respect to shelling percentage andoil content. The quantity of pod and haulm yield produced ha^{-1} was highest with pre - emergence application 2160 kg ha $^{-1}$ this was followed by two hand weeding at 15 DAS and 30 DAS. This next best treatment was pre emergence application of pendimethalin @ 1.0 kg ha $^{-1}$ followed by post emergence application of application imazethapyr @ 100 g ha^{-1} on 15 DAS. The percentage increase of the pod yield due to different herbicides and cultural practices 66.58 percent with pre emergence application of pendimethalin @ 1.0 kg ha $^{-1}$. The lowest pod yield was recorded in unweeded control. Higher pod and haulm yield may be due to early application of broad spectrum selective herbicide and further hand weeding provide weed free environment leads to improved of pod yield. Appreciable increase in pod and haulm yield with this treatment was also reported by Veeraputhiran and Chinnasamy (2007) [6].

Table 1: Total weed density at 15, 30 and 45 DAS

Treatment	15 DAS	30 DAS	45 DAS
T_1 - Unweed control	9.07 (81.90)	10.94 (119.31)	12.34 (151.84)
T_2 - Two hand weeding on 15 DAS &30 DAS	8.47 (71.71)	4.87 (23.26)	5.55 (30.40)
T_3 - Pendimethalin 1.0 kg ha^{-1} + HW on 30 DAS	3.17 (9.58)	4.33 (18.30)	5.06 (25.11)
T_4 - Oxyfluorfen 250g ha^{-1} + HW on 30 DAS	3.58 (12.34)	5.48 (29.58)	6.65 (42.56)
T_5 - Imazethapyr 100 g ha^{-1} on 15 DAS	9.13 (82.88)	5.94 (34.86)	8.29 (68.25)
T_6 - Quizalofop-p-ethyl 50 g ha^{-1} on 15 DAS	9.05 (81.45)	6.38 (40.24)	5.79 (33.04)
T_7 - Pendimethalin1.0kg ha^{-1} + Imazethapyr 100g ha^{-1}	3.26 (10.16)	5.03 (24.85)	6.12 (36.98)
T_8 - Oxyfluorfen250 g ha^{-1} + Imazethapyr 100 g ha^{-1}	3.54 (12.10)	5.53 (30.14)	6.64 (43.50)
T_9 - Pendimethalin.0kg ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	3.27 (10.24)	5.41 (28.85)	6.75 (45.18)
T_{10} - Oxyfluorfen250 g ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	3.97 (15.32)	5.58 (30.68)	7.12 (50.22)
T_{11} - Imazethapyr 100 g ha^{-1} + HW on 30 DAS.	8.96 (80.32)	5.91 (34.52)	6.29 (39.18)
T_{12} - Quizalofop-p-ethyl 50 g ha^{-1} + HW on 30 DAS	9.06 (81.60)	6.42 (40.83)	6.40 (40.57)
S.Ed	0.21	0.24	0.24
CD(P=0.05)	0.40	0.44	0.48

Table 2: Group wise weed density at 45 DAS

Treatment	BLW	Grass	Sedges
T_1 - Unweed control	9.60 (91.66)	6.38 (40.24)	4.52 (19.94)
T_2 - Two hand weeding on 15 DAS &30 DAS	3.28 (10.32)	3.09 (9.10)	3.38 (10.98)
T_3 - Pendimethalin 1.0 kg ha^{-1} + HW on 30 DAS	3.10 (8.16)	2.82 (7.48)	3.15 (9.47)
T_4 - Oxyfluorfen 250g ha^{-1} + HW on 30 DAS	3.25 (11.10)	3.33 (10.61)	4.39 (19.84)
T_5 - Imazethapyr 100 g ha^{-1} on 15 DAS	4.46 (19.40)	5.62 (31.10)	5.49 (29.71)
T_6 - Quizalofop-p-ethyl 50 g ha^{-1} on 15 DAS	4.78 (21.84)	4.56 (19.81)	4.49 (19.71)
T_7 - Pendimethalin1.0kg ha^{-1} + Imazethapyr 100g ha^{-1}	3.46 (11.50)	3.29 (10.36)	3.41 (11.18)
T_8 - Oxyfluorfen250 g ha^{-1} + Imazethapyr 100 g ha^{-1}	3.57 (13.25)	3.29 (10.86)	4.45 (19.39)
T_9 - Pendimethalin.0kg ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	4.15 (16.80)	3.47 (11.60)	4.15 (16.78)
T_{10} - Oxyfluorfen250 g ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	4.37 (18.60)	3.59 (12.40)	4.44 (19.22)
T_{11} - Imazethapyr 100 g ha^{-1} + HW on 30 DAS.	3.35 (10.74)	4.37 (18.60)	3.21 (9.84)
T_{12} - Quizalofop-p-ethyl 50 g ha^{-1} + HW on 30 DAS	3.40 (11.10)	4.38 (18.74)	(3.35 10.73)
S.Ed	0.08	0.12	0.07
CD(P=0.05)	0.16	0.25	0.14

Table 4: Weed Control Efficiency 15, 30 and 45 DAS

Treatment	15 DAS	30 DAS	45 DAS
T_1 - Unweed control	-	-	-
T_2 - Two hand weeding on 15 DAS &30 DAS	12.44	80.50	79.97
T_3 - Pendimethalin 1.0 kg ha^{-1} + HW on 30 DAS	88.30	85.33	83.46
T_4 - Oxyfluorfen 250g ha^{-1} + HW on 30 DAS	84.93	75.20	71.97
T_5 - Imazethapyr 100 g ha^{-1} on 15 DAS	1.19	70.78	55.05
T_6 - Quizalofop-p-ethyl 50 g ha^{-1} on 15 DAS	0.54	66.27	53.00
T_7 - Pendimethalin1.0kg ha^{-1} + Imazethapyr 100g ha^{-1}	87.59	79.17	78.24
T_8 - Oxyfluorfen250 g ha^{-1} + Imazethapyr 100 g ha^{-1}	85.22	74.73	71.35
T_9 - Pendimethalin.0kg ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	87.49	75.81	70.24
T_{10} - Oxyfluorfen250 g ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	81.29	74.28	66.92
T_{11} - Imazethapyr 100 g ha^{-1} + HW on 30 DAS.	1.92	71.06	74.19
T_{12} - Quizalofop-p-ethyl 50 g ha^{-1} + HW on 30 DAS	0.36	65.77	73.28

Table 5: Effect of weed management practices on shelling percentage, oil content, pod and haulm yield

Treatment	Pod yield	Haulm yield	Shelling percentage	Oil content (%)
T_1 - Unweed control	721.98	1090.11	74.51	48.06
T_2 - Two hand weeding on 15 DAS &30 DAS	2029.66	3855.10	74.82	48.16
T_3 - Pendimethalin 1.0 kg ha^{-1} + HW on 30 DAS	2160.48	4212.51	74.81	48.16
T_4 - Oxyfluorfen 250g ha^{-1} + HW on 30 DAS	1912.61	3537.20	74.78	48.14
T_5 - Imazethapyr 100 g ha^{-1} on 15 DAS	1211.66	2119.25	74.61	48.08
T_6 - Quizalofop-p-ethyl 50 g ha^{-1} on 15 DAS	1101.58	1707.44	74.58	48.07
T_7 - Pendimethalin1.0kg ha^{-1} + Imazethapyr 100g ha^{-1}	1906.50	3527.02	74.76	48.13
T_8 - Oxyfluorfen250 g ha^{-1} + Imazethapyr 100 g ha^{-1}	1770.90	2833.44	74.73	48.12
T_9 - Pendimethalin.0kg ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	1487.35	2454.12	74.68	48.10
T_{10} - Oxyfluorfen250 g ha^{-1} + Quizalofop-p-ethyl 50 g ha^{-1}	1360.20	2312.00	74.65	48.09
T_{11} - Imazethapyr 100 g ha^{-1} + HW on 30 DAS.	1642.58	2955.56	74.71	48.11
T_{12} - Quizalofop-p-ethyl 50 g ha^{-1} + HW on 30 DAS	1515.47	2500.52	74.64	48.09
S.Ed	59.02	141.98	0.10	0.10
CD(P=0.05)	126.90	283.85	NS	NS

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