# Climate Change Impact on Integrated Weed Management in Groundnut

**Satya Kumari Sharma[1*], J.A. Chudasama[2], Rahul Sharma[3] and R.K Mathukia[4]**

*[1,2,3,4]Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh-362001 (Gujarat, India)*
*E-mail: [1]satya.sharma77@yahoo.com*

**Abstract—***An investigationwas undertakenin randomized block designwith twelve treatments during kharif season of 2012-13 at Instruction Farm, JAU, Junagadh(Gujarat, India) to study the integrated weed management in groundnut. Results revealed that application of pendimethalin @ 0.900 kg ha$^{-1}$ as pre-emergence + imazethapyr @ 75 g ha$^{-1}$ at 20 days after sowing were found equally effective to the weed free check in controlling weeds and improving yield attributes and quality parameters and ultimately seed yield (1709 kg ha$^{-1}$) and stalk yield (2567 kg ha$^{-1}$) of groundnut and which was at par with hand weeding (20 days after sowing) &interculturing (40 days after sowing) and pendimethalin @ 0.900 kg ha-1 as pre-emergence plus hand weeding and interculturing at 40 days after sowing. However, significantly highest nitrogen, phosphorus and potassium in soil after crop harvest was recorded with oxadiargyl @ 90 g ha$^{-1}$ as post-emergence at 20 days after sowing plus hand weeding and interculturing at 40 days after sowing.*

**Keywords***: groundnut, oxadiargyl, imazethapyr, pendimethalin.*

## 1. INTRODUCTION

Modified growing conditions, due to climate change, will influence the occurrence and dominance of plant species and biodiversity. As weed populations show greater variations, it is possible that with a changed climate weeds too will achieve a greater competitive fitness against the crop plants. In many cases the impacts of invasive species benefiting from climate change are likely to exceed the direct impacts of climate change. Hence, under climate change condition, efficient weed management practices need to be assessed to enhance groundnut production.

Groundnut is the third largest oilseed produced in world. Groundnut covers total area of 18.9 million hectares with production of 17.8 million tonnes in the world.In Gujarat, the region of Saurashtra is considered to be the groundnut bowl of the country. During *kharif*, weed infestation is a severe problem in groundnut due to its slow initial growth, low height, less canopy and wide inter row spacing (60 cm). Manual weeding and mechanical weeding through bullock/mini tractor drawn implements is, even though, effective but increases cost of cultivation tremendously due to hike in labour prices in recent past thereby decreasing net returns from groundnut cultivation. Moreover, manual or mechanical weeding is not preferable after about 45 days of sowing as it interferes in peg penetration and pod formation in groundnut. Therefore, weed control through herbicides, especially in cases of labour shortage and when field condition is not suitable for manual and mechanical weeding, is very useful. Scanty scientific information is available regarding weed management in groundnut especially for south Saurashtra region of Gujarat, hence, present experiment was undertaken to find out appropriate integrated weed management practice for groundnut.

## 2. MATERIAL AND METHODS

An experimental was conducted at Department of Agronomy, College of Agriculture,Junagadh Agricultural University, Junagadh (Gujarat, India) for *kharif*season of the year 2012-13. Total 12 treatments *viz*., pendimethalin 30% EC @ 0.900 kg ha$^{-1}$ PE + HW & IC at 40 DAS, pendimethalin 38.7% CS @ 0.750 kg ha$^{-1}$ PPI + HW & IC at 40 DAS, oxyfluorfen @ 0.240 kg ha$^{-1}$ PE + HW & IC at 40 DAS, quizalofop-ethyl @ 40 g ha$^{-1}$ POE at 20 DAS + HW & IC at 40 DAS, pendimethalin30% EC @ 0.900 kg ha$^{-1}$ PE + quizalofop-ethyl @ 40 g ha$^{-1}$ POE at 20 DAS, imazethapyr @ 75 g ha$^{-1}$ POE at 20 DAS + HW & IC at 40 DAS, pendimethalin 30% EC @ 0.900 kg ha$^{-1}$ PE + imazethapyr @ 75 g ha$^{-1}$ POE at 20 DAS, oxadiargyl @ 90 g ha$^{-1}$ POE at 20 DAS + HW & IC at 40 DAS, propaquizafop @ 90 g ha$^{-1}$ POE at 20 DAS + HW & IC at 40 DAS, HW & IC at 20 & 40 DAS, weedfree and unweeded control were tested in randomized block design and replicated thricewere tested in randomized block design and replicated thrice. The total rainfall received during the crop growth period was 1047.1 mm during 2012-13 with fairly good distribution. The soil was medium clayey in texture and slightly alkaline in reaction with pH (7.98) and EC (0.29dS m$^{-1}$), low in available N (237.8 kg ha$^{-1}$), and medium in available P (23.34 kg ha$^{-1}$) and available K (249.18 kg ha$^{-1}$). Groundnut 'GG-20' (semi spreading type) was sown at 60 x 10 cm spacing using seed rate of 120 kg ha$^{-1}$with recommended dose of fertilizers i.e. 12.5 kg Nha$^{-1}$, 25 kg $P_2O_5$ ha$^{-1}$ and 0 kg $K_2O$ ha$^{-1}$.

## 3. RESULTS AND DISCUSSION

### 3.1 Effect on yield attributes and yield

An appraisal of data (Table 1) showed that various weed management practices significantly influenced yield attributes of groundnut. Significantly the highest test weight, pod and haulm yield were recorded under the weed free check, however it remained at par with HW (20 DAS) & IC (40 DAS), pendimethalin 30% EC @ 0.900 kg $ha^{-1}$as PE + imazethapyr and pendimethalin 30% EC @ 0.900 kg $ha^{-1}$ as PE + HW & IC 40 DAS in respect of test weight, pod and haulm yield. Whereas, significantly the lowest values of yield attributes were registered under the weedy check. Periodical removal of weeds by hand weeding and interculturing or herbicide application supplemented with weeding and interculturing suppressed weeds, which in turn provided better weed free environment to the crop during critical period for growth and development.

### 3.2 Effect on quality parameters

The data (Table 2) indicated that different weed management treatments exerted significant effect on protein and oil content in kernels.Protein and oil content in kernel were significantly influenced by different weed management practices. Significantly higher protein and oil content in kernel were recorded under weedfree, which remained statistically at par with HW & IC at 20 & 40 DAS, pendimethalin 30% EC @ 0.900 kg $ha^{-1}$ as PE + imazethapyr75 g $ha^{-1}$ at 20 DAS, pendimethalin 30% EC @ 0.900 kg $ha^{-1}$ as PE + HW & IC at 40 DAS and propaquizafop @ 90 g $ha^{-1}$ as POE at 20 DAS + HW at 40 DAS and significantly the lowest values of protein and oil content in kernel were recorded under unweeded check (Table 2). These results are in conformity with findings of Chhatrala (2006) andSingh and Singh (2009).

### Effect on weed parameters

An appraisal of data (Table 2) showed that various weed management practices significantly influenced dry weight of weeds. All the weed management treatments significantly reduced dry weight of weeds over the unweeded control. Next to the weedfree, HW & IC at 20 & 40 DAS recorded significantly the lowest weed dry weight ( kg $ha^{-1}$), which was statistically at par with pendimethalin 30% EC @ 0.900 kg $ha^{-1}$ as PE + imazethapyr @ 75 g $ha^{-1}$ as POE at 20 DAS and pendimethalin 30% EC @ 0.900 kg $ha^{-1}$ as PE + HW & IC at 40 DAS.These findings are in conformity with those reported by Chaudhari*et al*. (2007) and Jhala*et al.* (2013).

### Effect on soil nutrient status

Available nitrogen, phosphorus and potassium in soil after harvest of groundnut were significantly affected by different weed control practices (Table 3). Highest available nitrogen, phosphorus and potassium in the soil after harvest of the crop was recorded under oxadiargyl @ 90 g $ha^{-1}$ as POE at 20 DAS + HW & IC at 40 DAS, which remained statistically at par with pendimethalin 38.7% CS @ 0.750 kg $ha^{-1}$ as PPI + HW & IC at 40 DAS andoxyfluorfen @ 0.240 kg $ha^{-1}$ as PE + HW & IC at 40 DAS. However, significantly lowest available nitrogen, phosphorus and potassium in the soil after harvest of the crop were recorded under unweeded control.

## 4. CONCLUSION

Effective control of weeds in kharif groundnut along with higher yield and quality of kernel could be achieved by keeping the crop weed free through hand weeding and interculturing as and when required or pre-emergence application of pendimethalin 30% EC @ 0.900 kg $ha^{-1}$followed by post-emergence of imazethapyr @ 75 g $ha^{-1}$ or pre-emergence application of pendimethalin 30% EC @ 0.900 kg $ha^{-1}$ followed by one hand weeding in row zone and interculturing in inter row zone at 40 DAS, or one hand weeding at 20 DAS followed by one interculturing at 40 DASand propaquizafop @ 90 g $ha^{-1}$ as POE at 20 DAS followed by one hand weeding at 20 DAS followed by one interculturing at 40 DAS under south Saurashtraagro-climatic conditions of Gujarat, India.

## REFERENCE

[1] DOA, 2012. Directorate of Economics and Statistics, Directorate of Agriculture and Cooperation, Government of India, New Delhi.

[2] Dubey, M.; Singh, S.; Kewat, M.L. and Sharma, J.K. 2010. To evaluate the efficacy of imazethapyr against weeds in groundnut. *Indian Journal of Weed Science*, **42**(1&2): 27-30.

[3] Jat, R.S.; Meena, H.N.; Singh, A.L.; Surya, J.N. and Misra, J.B. 2011. Weed management in groundnut (*Arachishypogaea* L.) in India- A Review. *Agricultural Reviews*, **32**(3): 155-171.

[4] Kalhapure, A.H., Shete, B.T. and Bodake, P.S. 2013. Integration of chemical and cultural methods for weed management in groundnut. *Indian Journal of Weed Science* **45**(2): 116-119.

[5] Pandey, C.S. and Apdhiar, R.G. 2000. Efficacy of different herbicides for weed control in groundnut. *Indian Journal of Environment and Toxicology*, **10**(1): 8-10.

[6] Vilas, M.B.; Jayashri, V.K. and Yuvraj R.P. 2012. Integrated weed management in *kharif* groundnut. *Pakistan Journal of Weed Science and Research*, **18**: 733-739.

[7] Patel, P.G.; Chadhari, P.P.; Patel, V.A. and Patel, M.M. 2006. Integrated weed management in summer groundnut (*Arachishypogaea* L.). *Journal of Maharashtra Agricultural Universities*, **31**(2): 162-164.

[8] Ramalingam, S.P.and Perumal, M.2013. Evaluation of new formulation of oxyfluorfen on weed control of groundnut and its residual effect on succeeding crops. *Indian Journal of Applied Research*, **3**(6): 16-18.

[9] Sukhadia, N.M.; Asodaria, K.B. and Modhwadia, M.M. 1998. Comparative efficacy of pre and post emergence herbicide application in spreading groundnut. *Indian Journal of Weed Science*, **30**(3&4):163-167.

**Table 1: Effect of different treatments on yield attributesin the year of 2012-13**

| Treatments | Dose (g ha-1) | Shelling (%) | Yield (kg ha-1) | | HI (%) |
|---|---|---|---|---|---|
| | | | Pod | Haulm | |
| T1- Pendimethalin 30% EC + HW & IC at 40 DAS | 900 | 70.07 | 1665 | 2464 | 40.33 |
| T2- Pendimethalin 38.7% CS + HW & IC at 40 DAS | 750 | 69.33 | 1405 | 2295 | 37.98 |
| T3- Oxyfluorfen + HW & IC at 40 DAS | 240 | 69.40 | 1399 | 2249 | 38.00 |
| T4- Quizalofop-ethyl + HW & IC at 40 DAS | 40 | 68.70 | 1480 | 2276 | 39.40 |
| T5- Pendimethalin 30% EC + Quizalofop-ethyl | 900 | 69.07 | 1530 | 2375 | 39.18 |
| T6- Imazethapyr+ HW & IC at 40 DAS | 75 | 68.47 | 1467 | 2213 | 39.87 |
| T7- Pendimethalin 30% EC + Imazethapyr1 | 900 | 71.95 | 1685 | 2467 | 40.57 |
| T8- Oxadiargyl + HW & IC at 40 DAS | 90 | 69.33 | 1297 | 2127 | 37.91 |
| T9- Propaquizafop + HW & IC at 40 DAS | 90 | 71.37 | 1597 | 2488 | 39.09 |
| T10- HW & IC at 20 & 40 DAS | - | 71.33 | 1606 | 2510 | 39.03 |
| T11-Weedfree | - | 73.03 | 1709 | 2567 | 39.98 |
| T12-Unweeded control | - | 58.54 | 886 | 1317 | 40.12 |
| S.Em.+ | | 0.99 | 60.79 | 37.76 | 1.10 |
| C.D. (P=0.05) | | 2.90 | 178 | 111 | NS |
| C.V. (%) | | 6.47 | 7.13 | 7.87 | 4.85 |

**Table 2: Effect of different treatments on weed and quality parameters in the year of 2012-13**

| Treatments | Dose (g ha-1) | Dry weight of weeds (kgha-1) | Content in kernels | |
|---|---|---|---|---|
| | | | Protein | Oil |
| T1- Pendimethalin 30% EC + HW & IC at 40 DAS | 900 | 238 | 26.27 | 47.83 |
| T2- Pendimethalin 38.7% CS + HW & IC at 40 DAS | 750 | 398 | 25.55 | 46.19 |
| T3- Oxyfluorfen + HW & IC at 40 DAS | 240 | 425 | 25.53 | 44.04 |
| T4- Quizalofop-ethyl + HW & IC at 40 DAS | 40 | 450 | 26.01 | 45.73 |
| T5- Pendimethalin 30% EC + Quizalofop-ethyl | 900 | 480 | 25.63 | 46.87 |
| T6- Imazethapyr+ HW & IC at 40 DAS | 75 | 400 | 26.02 | 45.87 |
| T7- Pendimethalin 30% EC + Imazethapyr1 | 900 | 235 | 26.56 | 47.37 |
| T8- Oxadiargyl + HW & IC at 40 DAS | 90 | 500 | 25.81 | 43.56 |
| T9- Propaquizafop + HW & IC at 40 DAS | 90 | 261 | 26.31 | 47.47 |
| T10- HW & IC at 20 & 40 DAS | - | 200 | 26.56 | 47.67 |
| T11-Weedfree | - | 0.00 | 26.83 | 49.79 |
| T12-Unweeded control | - | 1446 | 24.33 | 39.93 |
| S.Em.+ | | 21.43 | 0.23 | 0.95 |
| C.D. (P=0.05) | | 62.84 | 0.68 | 2.79 |
| C.V. (%) | | 8.85 | 7.55 | 3.58 |

**Table 3: Effect of different treatments on available nutrient in soil in the year of 2012-13**

| Treatments | Dose (g ha-1) | Available in soil (kg ha-1) | | |
|---|---|---|---|---|
| | | Nitrogen | Phosphorus | Potassium |
| T1- Pendimethalin 30% EC + HW & IC at 40 DAS | 900 | 189.49 | 15.73 | 185.48 |
| T2- Pendimethalin 38.7% CS + HW & IC at 40 DAS | 750 | 191.02 | 17.10 | 192.78 |
| T3- Oxyfluorfen + HW & IC at 40 DAS | 240 | 190.37 | 16.89 | 194.72 |
| T4- Quizalofop-ethyl + HW & IC at 40 DAS | 40 | 189.35 | 16.28 | 192.49 |
| T5- Pendimethalin 30% EC + Quizalofop-ethyl | 900 | 187.70 | 15.01 | 187.20 |
| T6- Imazethapyr+ HW & IC at 40 DAS | 75 | 193.99 | 17.21 | 193.16 |

| | | | | |
|---|---|---|---|---|
| T7- Pendimethalin 30% EC + Imazethapyr | 900 | 183.20 | 15.75 | 185.27 |
| T8- Oxadiargyl + HW & IC at 40 DAS | 90 | 198.56 | 17.49 | 194.98 |
| T9- Propaquizafop + HW & IC at 40 DAS | 90 | 185.80 | 15.86 | 186.00 |
| T10- HW & IC at 20 & 40 DAS | - | 185.08 | 16.04 | 186.24 |
| T11-Weedfree | - | 183.29 | 16.55 | 186.22 |
| T12-Unweeded control | - | 171.93 | 10.44 | 182.11 |
| S.Em.+ | | 0.84 | 0.40 | 0.78 |
| C.D. (P=0.05) | | 2.45 | 1.17 | 2.29 |
| C.V. (%) | | 8.83 | 13.96 | 6.53 |