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# Allelopathic and Integrated Weed Management with *Calotropis gigantea* Leaf Extract in Cotton

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**Field experiments were conducted during 2013 and 2014, at Agricultural College and Research Institute, Madurai (Tamil Nadu Agricultural University) to study the effect of pre-emergence application of *Calotropis gigantea leaf* extract spray on weed control in cotton. The weed management practices consisted of *Calotropis gigantea* leaf extract spray at three concentrations (10, 20 and 30%) in combination with power weeder operation twice and manual weeding twice. The results revealed that pre-emergence application of *Calotropis gigantea* at 30 % concentration followed by hand weeding at 40 DAS recorded lower weed density and dry weight and increased the yield in irrigated cotton**

**Key words:** *Calotropis gigantea leaf* extract, Weed density, Weed dry weight, Yield

In India, cotton is grown under diverse agro-climatic conditions. Cotton is the most important commercial crop contributing nearly 65% of total raw material needs of textile industry in our country. India ranks first in global scenario occupying about 33 % of the world cotton area but with regard to production it ranks second, next to China. Cotton varieties are cultivated at wider spacing, which in turn invites multiple weed species infestation. Weed competition is severe during its initial growth stages. The increasing costand unavailability of labour in time has forced to use herbicides for weed control in cotton. Hence, there is a need for selection of pre-emergence herbicides to control early emerging weeds during initial crop growth period.Several herbicidesare used in cotton.Indiscriminate use of herbicides has resulted in serious ecological implications such as resistance and shifts in weed population, minor weeds becoming dominant, greater environmental pollution and health hazards. Recently, research attention is focused on to find out alternative strategies for chemical weed control in crops.For this, allelochemicals present in the plant species may be used to develop newer bioherbicide to combat the evolution of herbicide resistance in weeds and by reducing the chemical usage in weed control in cotton. Hence, allelopathic crops may be used in different ways such as, surface mulch, incorporation into the soil, spraying of leaf extracts, crop rotation, smothering or mixed cropping and intercropping to influence weeds.

The use of allelopathic plant extracts is economical and eco friendly but, the reduction in weed biomass is less than herbicides and manual weeding (Abdul Khaliq *et al.,* 2012).Allelopathic plant, *Calotropis gigantea* contains several chemicals such as Calotropone, Gofruside (Zhu-NianWang *et al.,*2008) and the latex contains the cardiac glycosides, calotopin, uscharin, calotoxin, calactin, uscharidin and gigantin (Narendra Nalwaya *et al.,* 2009).Allelopathic activity is not attributed to the effect of a single compound, but it is the result of combination and interaction of many allelochemicals in plant species. Oudhia *et al.,* (1999) reported that the extracts of leaf and stem of *Calotropis gigantea* affected germination and seedling vigour of agricultural crops. Effect of *Calotropis gigantea* on weeds has not been well studied. Traditionally, in Tamil Nadu, calotropis plant biomass is incorporated in fields before planting. Based on this concept, the present study was carried out to evaluate the efficacy of *Calotropis gigantea for* weed control in cotton and compared with herbicides, mechanical and physical weed control methods.

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## Materials and Methods

Field experiments were conducted at Agricultural College and Research Institute, Madurai during 2013 and 2014. Field trials were laid out in a randomized block design with fourteen treatments replicated thrice. The weed management practices evaluated in the present study consisted of *Calotropis gigantea* leaf extract spray at three concentrations (10, 20 and 30%), power weeder weeding (PW twice) and manual weeding (hand weeding twice) in combination. The various weed management practices *viz.,* PE *Calotropis gigantea* 30% + one hand weeding (T1), PE *Calotropis gigantea* 30% + one power weeding (T2), PE Calotropis gigantea 30% + EPoE of *Calotropis gigantea* 30% (T3),PE *Calotropis gigantea* 20% + one hand weeding (T4), PE *Calotropis gigantea* 20% + one power weeding (T5), PE *Calotropis gigantea* 20% + EPoE of *Calotropis gigantea* 20% ( T6), PE *Calotropis gigantea* 10% + one hand weeding (T7), PE *Calotropis gigantea* 10% + one power weeding (T8), PE *Calotropis gigantea* 10% + EPoE of *Calotropis gigantea* 10% (T9)were tested and compared with unweeded control (T10). Leaf extracts of 10, 20 and 30 per cent concentrations

were sprayed on 3 DAS (PE) and 10 DAS (EPoE) by using hand sprayer. Weed management practices (hand and power weeding) were done on 40 DAS.

***Method of leaf extracts preparation***

The fresh leaves of *Calotropis gigantea* were collected, cut into small pieces and soaked in alcohol @ 1:1 proportion and kept for overnight. After 12 h, soaked leaves were ground with the help of mixer grinder. From the paste, the leaf extract were prepared by filtration, which is 100 per cent stock solution. From the stock solution, 10, 20 and 30 per cent concentrations were prepared and sprayed on 3 DAS (PE) and 10 DAS (EPoE) by using hand sprayer.In this experiment SVPR 4 variety was used and the NPK recommendation @ 80:40:40 kg $ha^{-1}$ was applied.

## Results and Discussion

***Effect onweeds***

Weed flora of the experimental field consisted of fourteen weeds and among these weeds, *Cyanodon dactylon* and *Echinochloa colonum* were the dominantgrass, *Cyperus rotundus* was the only sedge, *Trianthema portulacastrum*, *Corchorus trilocularis* and *Cleome viscosea* were the predominant broad leaved weeds.

**Table1. Effect of *Calotropis gigantea* leaf extract spray on total weed density of cotton**

| Treatments | Total weed density at 60 DAS (No. $m^{-2}$) | | | | | |
|---|---|---|---|---|---|---|
| | 2013 | | | 2014 | | |
| | Grass | Sedge | BLW | Grass | Sedge | BLW |
| T1 - PE C. *gigantea* @ 30 % + HW on 40 DAS | 11.92 (3.52) | 7.85 (2.89) | 24.95 (5.04) | 8.17 (2.94) | 6.47 (2.64) | 12.59 (3.62) |
| T2 - PE C. *gigantea* @ 30 % + PWW on 40 DAS | 12.28 (3.57) | 8.08 (2.93) | 26.54 (5.20) | 8.66 (3.03) | 6.74 (2.69) | 13.99 (3.81) |
| T3 - PE C. *gigantea* @ 30 % + EPoE C. gigantea @ 30 % | 29.89 (5.51) | 12.24 (3.57) | 67.64 (8.25) | 26.81 (5.23) | 11.54 (3.47) | 43.99 (6.67) |
| T4 - PE C. *gigantea* @ 20 % + HW on 40 DAS | 12.71 (3.63) | 8.32 (2.97) | 33.41 (5.82) | 9.04 (3.09) | 6.95 (2.73) | 22.34 (4.78) |
| T5 - PE C. *gigantea* @ 20 % + PWW on 40 DAS | 13.19 (3.70) | 8.80 (3.05) | 34.93 (5.95) | 9.37 (3.14) | 7.12 (2.76) | 23.70 (4.92) |
| T6 - PE C. *gigantea* @ 20 % + EPoE C. gigantea @ 20 % | 30.76 (5.59) | 12.53 (3.61) | 70.55 (8.43) | 28.10 (5.35) | 11.82 (3.51) | 46.06 (6.82) |
| T7 - PE C. *gigantea* @ 10 % + HW on 40 DAS | 13.74 (3.77) | 8.86 (3.06) | 44.57 (6.71) | 9.47 (3.16) | 7.28 (2.79) | 30.06 (5.53) |
| T8 - PE C. *gigantea* @ 10 % + PWW on 40 DAS | 14.31 (3.85) | 9.05 (3.09) | 46.33 (6.84) | 9.84 (3.21) | 7.45 (2.82) | 31.15 (5.63) |
| T9 - PE C. *gigantea* @ 10 % + EPoE C. *gigantea* @ 10 % | 32.25 (5.72) | 12.90 (3.66) | 75.30 (8.71) | 29.13 (5.44) | 12.39 (3.59) | 48.68 (7.01) |
| T10 - Unweeded control | 33.57 (5.84) | 13.86 (3.79) | 86.73 (9.34) | 29.99 (5.52) | 12.75 (3.64) | 56.26 (7.53) |
| S. Ed | 0.17 | 0.115 | 0.295 | 0.16 | 0.105 | 0.215 |
| CD (P = 0.05) | 0.34 | 0.23 | 0.59 | 0.32 | 0.21 | 0.43 |

Data subjected to $\sqrt{(X+0.5)}$ transformation values, figures in the parenthesis are transformed values

The results of the experiment revealed that the broad leaved weeds dominated over grasses and sedges in cotton during the initial growth stage. Among broad leaved weeds, Trianthema portulacastrum was the dominant weed flora during both the years. Dominance of broad leaved weeds in early stages was due to their faster growth and deep root system and thus, promoted the absorption of soil moisture as reported by Prabukumar (2004).

***Effect on weed density, weed dry weight and weed control efficiency***

At 60 DAS, the integrated weed management practices like PE *Calotropis gigantea* at 30 per cent + HW (T1) and PE *Calotropis gigantea* at 30 per cent + PW (T2) performed better because of application *Calotropis gigantea* at 30 per cent on 3 DAS and one hand weeding or power weeding done on 40 DAS. All the weed control methods reduced the density of three types of weeds at 60 DAS compared to unweeded control in both seasons (Table 1 and 2). Pre emergence application of *Calotropis gigantea* @30 % with one HW on 40 DAS and pre emergence application of *Calotropis gigantea* @30 % with one PWW on 40 DAS resulted in effective control of all the weeds. Pre emergence application of *Calotropis*

*gigantea* @30 % with one HW on 40 DAS recorded with reduced grass weed density (11.92 $m^{-2}$; 8.17 $m^{-2}$), grass dry weight (33.26 kg $ha^{-1}$;30.19 kg $ha^{-1}$), broad leaved weed density (24.95$m^{-2}$; 12.59 $m^{-2}$) and dry weight (45.88 kg $ha^{-1}$; 34.19 kg $ha^{-1}$) in both the years. Pre emergence application of *Calotropis gigantea* @30 % with one HW on 40 DAS registered the sedge weed density of 7.85 $m^{-2}$; 6.47 $m^{-2}$ and dry weight of 18.95 kg $ha^{-1}$; 11.96 kg $ha^{-1}$ in 2013 and 2014, respectively. Un weeded control recorded higher weed dry weight and weed density of grass (33.57 $m^{-2}$; 29.99 $m^{-2}$), sedge (13.86 $m^{-2}$; 12.75 $m^{-2}$) and broad leaved weed (86.73 $m^{-2}$; 56.26 $m^{-2)}$ in both the years at 60 DAS.

**Table 2. Effect of *Calotropis gigantea* leaf extract spray on total weed dry weight in cotton**

| Treatments | Total weed dry weight at 60 DAS (g $m^{-2}$) | | | | | |
|---|---|---|---|---|---|---|
| | 2013 | | | 2014 | | |
| | Grass | Sedge | BLW | Grass | Sedge | BLW |
| T1 - PE C. *gigantea* @ 30 % + HW on 40 DAS | 33.26 (5.81) | 18.95 (4.41) | 45.88 (6.81) | 30.19 (5.54) | 11.96 (3.53) | 34.19 (5.89) |
| T2 - PE C. *gigantea* @ 30 % + PWW on 40 DAS | 33.49 (5.83) | 18.95 (4.41) | 46.97 (6.89) | 30.41 (5.56) | 11.96 (3.53) | 34.78 (5.94) |
| T3 - PE C. *gigantea* @ 30 % + EPoE C. *gigantea* @ 30 % | 44.26 (6.69) | 41.62 (6.49) | 239.44 (15.49) | 39.70 (6.34) | 29.42 (5.47) | 188.84 (13.76) |
| T4 - PE C. *gigantea* @ 20 % + HW on 40 DAS | 34.78 (5.94) | 19.12 (4.43) | 48.08 (6.97) | 31.20 (5.63) | 11.96 (3.53) | 36.83 (6.11) |
| T5 - PE C. *gigantea* @ 20 % + PWW on 40 DAS | 35.02 (5.96) | 19.12 (4.43) | 50.05 (7.11) | 31.20 (5.63) | 11.96 (3.53) | 37.45 (6.16) |
| T6 - PE C. *gigantea* @ 20 % + EPoE C. *gigantea* @ 20 % | 44.93 (6.740 | 42.01 (6.52) | 241.92 (15.57) | 40.72 (6.42) | 29.97 (5.52) | 190.22 (13.81) |
| T7 - PE C. *gigantea* @ 10 % + HW on 40 DAS | 35.62 (6.01) | 19.48 (4.47) | 55.45 (7.48) | 31.65 (5.67) | 12.17 (3.56) | 39.44 (6.32) |
| T8 - PE C. *gigantea* @ 10 % + PWW on 40 DAS | 36.10 (6.05) | 19.48 (4.47) | 56.65 (7.56) | 31.76 (5.68) | 12.17 (3.56) | 40.59 (6.41) |
| T9 - PE C. *gigantea* @ 10 % + EPoE C. *gigantea* @ 10 % | 45.88 (6.81) | 42.53 (6.56) | 244.42 (15.65) | 41.88 (6.51) | 30.52 (5.57) | 194.38 (13.96) |
| T10 - Unweeded control | 50.19 (7.12) | 43.19 (6.61) | 269.45 (16.43) | 43.32 (6.62) | 31.20 (5.63) | 210.33 (14.52) |
| S. Ed | 0.23 | 0.21 | 0.97 | 0.21 | 0.17 | 0.39 |
| CD (P = 0.05) | 0.46 | 0.42 | 0.485 | 0.42 | 0.33 | 0.79 |

Data subjected to $\sqrt{(X+0.5)}$ transformation values, figures in the parenthesis are transformed values

Regarding the weed control efficiency (WCE) in broad leaved weed, pre emergence application of *Calotropis gigantea* at 30% with one hand weeding at 40 DAS registered higher WCE of 82.97 and 83.74 per cent in both the years respectively. The lowest WCE was recorded in pre emergence application of *Calotropis gigantea* at 10% followed by early post emergence application (EPoE) of *Calotropis gigantea* at 10% (T9) in grass, sedge and BLW in both years (Table 3).The higher concentration of 30 per cent leaf extract of *Calotropis gigantea* performed better in controlling broad leaved weeds. These treatments had moderate effect on grass weeds and no effect on sedge.

Ghasemi et *al.,* (2012) reported that *Calotropis procera* dry leaf water extract had the allelopathic properties of germination inhibition, plumule and radicle growth reduction in cucumber, brinjal and tomato at higher (60%) concentrations. Chellamuthu (1994) also reported that total dry weight of *Parthenium hysterophorus* was reduced by the leaf extract of *Prosopis juliflora*. It might be due to the presence of allelochemicals in the plant species. Plant extract with higher WCE on broad leaved weeds was also supported by Shobana, (2002).This might be possibly due to the effective prevention of seed germination of broad leaved weeds at earlier stage and late emerged weeds were controlled by weeding on 40 DAS (Ghasemi *et al.,* 2012).

***Effect on yield attributes and seed cotton yield***

Application of PE *Calotropis gigantea* at 30 per cent + HW (T1) and PE *Calotropis gigantea* at 30 per cent + PW (T2) recorded higher yield attributes in cotton (Table 4). Unweeded control recorded lesser sympodial branches, bolls per plant and boll weight due to season long infestation of weeds which resulted in reduced nutrient uptake and retarded growth of crop. Among the leaf extracts spray, *Calotropis gigantea* at 30% concentration with hand weeding at 40 DAS resulted in higher seed cotton yield (1884 and 2010 kg $ha^{-1}$) and yield attributes in both the years than lower concentrations. It might

be due to the growth promoting effect of *Calotropis gigantea* extracts that would have assisted in better growth and increase in seed cotton yield (Sripunitha, 2009).

Cotton being a wide spaced and slow growing crop is sensitive to weed competition at early stages of growth than at later stages. Weeds compete with crop for light, nutrients and water.

**Table 3.Effect of *Calotropis gigantea* leaf extract spray on total weed control efficiency (%) in cotton**

| Treatments | Total weed control efficiency (%) at 60 DAS | | | | | |
|---|---|---|---|---|---|---|
| | 2013 | | | 2014 | | |
| | Grass | Sedge | BLW | Grass | Sedge | BLW |
| T1 - PE C. *gigantea* @ 30 % + HW on 40 DAS | 33.75 | 56.13 | 82.97 | 30.31 | 61.66 | 83.74 |
| T2 - PE C. *gigantea* @ 30 % + PWW on 40 DAS | 33.28 | 56.13 | 82.57 | 29.80 | 61.66 | 83.46 |
| T3 - PE C. *gigantea* @ 30 % + EPoE C. *gigantea* @ 30 % | 11.83 | 3.64 | 11.14 | 8.38 | 5.69 | 10.22 |
| T4 - PE C. *gigantea* @ 20 % + HW on 40 DAS | 30.70 | 55.72 | 82.16 | 27.99 | 61.66 | 82.49 |
| T5 - PE C. *gigantea* @ 20 % + PWW on 40 DAS | 30.23 | 55.72 | 81.42 | 27.99 | 61.66 | 82.20 |
| T6 - PE C. *gigantea* @ 20 % + EPoE C. *gigantea* @ 20 % | 10.49 | 2.74 | 10.21 | 6.02 | 3.93 | 9.56 |
| T7 - PE C. *gigantea* @ 10 % + HW on 40 DAS | 29.04 | 54.90 | 79.42 | 26.95 | 60.98 | 81.25 |
| T8 - PE C. *gigantea* @ 10 % + PWW on 40 DAS | 28.07 | 54.90 | 78.97 | 26.69 | 60.98 | 80.70 |
| T9 - PE C. *gigantea* @ 10 % + EPoE C. *gigantea* @ 10 % | 8.60 | 1.52 | 9.40 | 3.33 | 2.15 | 7.58 |
| T10 - Unweeded control | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

This would have resulted in poor seed cotton yield under unweeded control (1356 kg ha$^{-1}$; 1517 kg ha$^{-1}$) in both seasons. Presence of weeds throughout the growing season caused poor crop growth and caused yield reduction in unweeded check (Nalini *et al.,* 2011).

***Effect of weed control treatments on economics***

Among the plant leaf extract treatments, PE *Calotropis gigantea* at 30 % + HW(T1) and PE *Calotropis gigantea* at 30 % + PW (T2) recorded

**Table 4.Effects of integrated weed management practices on yield attributes and yield of cotton**

| Treatments | Seed cotton yield and yield attributes | | | | | |
|---|---|---|---|---|---|---|
| | 2013 | | | 2014 | | |
| | Bolls plant$^{-1}$ (Nos.) | Boll weight (g boll$^{-1}$) | Seed cotton yield (kg ha$^{-1}$) | Bolls plant$^{-1}$ (Nos.) | Boll weight (g boll$^{-1}$) | Seed cotton yield (kg ha$^{-1}$) |
| T1 - PE C. *gigantea* @ 30 % + HW on 40 DAS | 21.61 | 3.68 | 1884 | 20.12 | 3.70 | 2010 |
| T2 - PE C. *gigantea* @ 30 % + PWW on 40 DAS | 21.33 | 3.68 | 1850 | 20.01 | 3.69 | 1998 |
| T3 - PE C. *gigantea* @ 30 % + EPoE C. *gigantea* @ 30 % | 12.01 | 3.16 | 1408 | 14.21 | 3.00 | 1582 |
| T4 - PE C. *gigantea* @ 20 % + HW on 40 DAS | 18.96 | 3.56 | 1638 | 17.43 | 3.67 | 1823 |
| T5 - PE C. *gigantea* @ 20 % + PWW on 40 DAS | 18.89 | 3.56 | 1603 | 17.13 | 3.67 | 1811 |
| T6 - PE C. *gigantea* @ 20 % + EPoE C. *gigantea* @ 20 % | 11.95 | 3.09 | 1385 | 13.55 | 3.00 | 1560 |
| T7 - PE C. *gigantea* @ 10 % + HW on 40 DAS | 18.62 | 3.47 | 1589 | 16.75 | 3.65 | 1782 |
| T8 - PE C. *gigantea* @ 10 % + PWW on 40 DAS | 18.56 | 3.47 | 1572 | 19.64 | 3.63 | 1759 |
| T9 - PE C. *gigantea* @ 10 % + EPoE C. *gigantea* @ 10 % | 11.78 | 2.96 | 1374 | 12.99 | 2.98 | 1541 |
| T10 - Unweeded control | 11.60 | 2.87 | 1356 | 12.90 | 2.96 | 1517 |
| S. Ed | 0.82 | 0.15 | 80 | 0.88 | 0.16 | 86 |
| CD (P = 0.05) | 1.63 | 0.30 | 159 | 1.77 | 0.31 | 172 |

higher net return of Rs. 24549/-, Rs. 23065/- per hectare in 2013 and Rs. 24534/- and Rs. 24290/- per hectare in 2014. Similarly B: C ratio of T1 and T2 were 1.48; 1.50 and 1.40; 1.44 in 2013 and 2014, respectively (Table 5). Among the leaf extracts, PE *Calotropis gigantea* at 30 per cent + power weeding

on 40 DAS (T2) recorded higher net return and B: C ratio due to reduced cost of cultivation by power weeding than other weed control methods. In this treatment, the additional income obtained over unweeded control was Rs. 11,378/- and Rs. 10,022/- during 2012 and 2013, respectively.

**Table 5. Economics of different weed management practices in cotton (2013 and 2014)**

| Treatments | 2013 | | | | 2014 | | | |
|---|---|---|---|---|---|---|---|---|
| | Total cost of cultivation (Rs $ha^{-1}$) | Gross income (Rs $ha^{-1}$) | Net income (Rs $ha^{-1}$) | B:C ratio | Total cost of cultivation (Rs $ha^{-1}$) | Gross income (Rs $ha^{-1}$) | Net income (Rs $ha^{-1}$) | B:C ratio |
| T1 - PE C. *gigantea* @ 30 % + HW on 40 DAS | 49811 | 75360 | 24549 | 1.48 | 56235 | 80400 | 23065 | 1.40 |
| T2 - PE C. *gigantea* @ 30 % + PWW on 40 DAS | 48466 | 74000 | 24534 | 1.50 | 54530 | 79920 | 24290 | 1.44 |
| T3 - PE C. *gigantea* @ 30 % + EPoE C. *gigantea* @ 30 % | 46388 | 56320 | 8932 | 1.19 | 52308 | 63280 | 9872 | 1.18 |
| T4 - PE C. *gigantea* @ 20 % + HW on 40 DAS | 49811 | 65520 | 14709 | 1.29 | 56235 | 72920 | 15585 | 1.27 |
| T5 - PE C. *gigantea* @ 20 % + PWW on 40 DAS | 48466 | 64120 | 14654 | 1.30 | 54530 | 72440 | 16810 | 1.30 |
| T6 - PE C. *gigantea* @ 20 % + EPoE C. *gigantea* @ 20 % | 46388 | 55400 | 8012 | 1.17 | 52308 | 62400 | 8992 | 1.17 |
| T7 - PE C. *gigantea* @ 10 % + HW on 40 DAS | 49811 | 63560 | 12749 | 1.25 | 56235 | 71280 | 13945 | 1.24 |
| T8 - PE C. *gigantea* @ 10 % + PWW on 40 DAS | 48466 | 62880 | 13414 | 1.27 | 54530 | 70360 | 14730 | 1.26 |
| T9 - PE C. *gigantea* @ 10 % + EPoE C. *gigantea* @ 10 % | 46388 | 54960 | 7572 | 1.16 | 52308 | 61640 | 8232 | 1.15 |
| T10 - Unweeded control | 41084 | 54240 | 13156 | 1.32 | 46412 | 60680 | 14268 | 1.31 |

## Conclusion

From the above study, it could be concluded, that pre emergence application of *Calotropis gigantea* leaf extract at 30 % + HW($T_1$) and pre emergence application of *Calotropis gigantea* leaf extract at 30 % + PWW($T_2$) will result in lesser weed density, dry weight and higher weed control efficiency (WCE). Pre emergence application of *Calotropis gigantea* leaf extract at 30% concentration along with hand weeding at 40 DAS ($T_1$) could keep the weed density and dry weight reasonably at a lower level and increased the yield attributes and seed cotton yield under irrigated condition.

## References


Abdul Khaliq, Amar Matloob, Asif Tanweer and Muhammad Bismillah Khan.2012. Naturally occurring phytotoxins in allelopathic plants help reduce herbicide dose in wheat. *Natural Product Research*.**26(12)**: 1156–1160.

Chellamuthu, V. 1994.Studies on silvicultural and ecological aspects of *Prosopisjuliflora* (Swartz) DC.Ph.D. Thesis, Tamil Nadu Agricultural University. Coimbatore.Tamil Nadu. India.

Ghasemi, S., Ghasemi, M., Moradi.N.and A. M. Shamili.2012. Effect of *Calotropisprocera* leaf extract on seed germination of some plants. *J. Ornamental and Horticultural Plants*.**2(1)**: 27-32.

Nalini,K., Muthukrishnan, P. and C. Chinnusamy. 2011. Evaluation of pendimethalin 38.7 EC on weed management in winter irrigated cotton. *Madras Agric. J.,* **98**(4-6): 165-168.

NarendraNalwaya, GauravPokharna, Lokesh Deb and Naveen Kumar Jain.2009. Wound healing activity of latex of *Calotropisgigantea.In:International J. Pharmacy and Pharmaceutical Sciences*.**1**: (176-181).1

Oudhia, P., Pandey, N. andTripathi.R.S.1999.Allelopathic effects of obnoxious weeds on germination and seedling vigour of hybrid rice.*International Rice research Notes*.**24(2)**: 36.

Prabukumar, G. 2004.Evaluation of early post-emergence herbicide for control of weeds in cotton and effectof its residue on crops grown in sequence. Ph.D. Thesis, Tamil Nadu Agric. Univ., Coimbatore, Tamil Nadu, India.

Shobana, J. 2002. Studies on plant leachates, herbicide and manual weeding as weed management practices in maize based intercropping system. M.Sc., Thesis, Tamil Nadu Agric. Univ., Coimbatore, Tamil Nadu, India.

Sripunitha, A. 2009. Herbal hydration-dehydration treatments for improving vigor, viability and productivity in tomato (*Lycopersiconesculentum*.Mill) cv. PKM 1. M.Sc., Thesis, Tamil Nadu Agric. Univ., Coimbatore, Tamil Nadu, India.

Zhu-Nian Wang, Mao-Yuan Wang, Wen-Li Mei, Zhuang Han and Hao-Fu Dai. 2008. A new cytotoxic pregnanone from *Calotropisgigantea.Molecules*.**13**: (3033-3039).


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