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# Influence of Integrated Weed Management Practices and Bio-Fertilizers on Chlorophyll Content of *Kharif* Soybean [*Glycine max (L.) Merill*] in Southern Telangana Agro- Climatic Zone

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**ABSTRACT**

A field experiment entitled "Influence of integrated weed management practices and bio-fertilizers on chlorophyll content of *kharif* soybean [*Glycine max (L.) Merill*] in southern Telangana agro- climatic zone" was conducted at the Agricultural College farm, Rajendranagar. Hyderabad,Telangana State during 2014 and 2015. In the present investigation, the chlorophyll content $cm^{-2}$ and $mg^{-1}$ fresh weight of green leaves exhibited significant differences due to weed management treatments the leaves in the un-weeded crop had maximum chlorophyll content of 139.11 n moles $cm^{-2}$ and 2.16 $mg^{-1}$ fresh weight of leaves in 2014. The chlorophyll content was 142.33 n moles $cm^{-2}$ and 2.22 $mg^{-1}$during 2015.Hand weeding at 25 and 45 DAS or the integrated weed management treatments did not change the chlorophyll remarkably. But, the pre and post emergence herbicide treatments significantly reduced the chlorophyll $cm^{-2}$ and $mg^{-1}$. Therefore, the complete dependence on herbicide use should be minimized or avoided. The chlorophyll concentration were not influenced by the bio-fertilizers at any stage in the two years. The interactions due to weed management treatments and bio-fertilizers were also not significant.

Key words: *Bio-Fertilizers, Chlorophyll Content, Integrated Weed Management Practices.*

Soybean [*Glycine max (L.) Merill*] is a miracle golden bean of the 20th century. It occupies third place among oilseed crops of Telangana State. It is a rich source of protein (40-42 %) and quality oil (20-22%). Protein is rich in valuable amino acid with 5% lycine. It also contains good amount of minerals, salts and vitamins. The crop weeding should be done during a short period of 3-4 weeks after sowing the crop. This will eliminate or minimize the crop-weed competition during the critical phase of 4-6weeks ( Gethe *et al.*,2011; Peer *et al*.,2013 and Jha *et al*.,2014) . Use of growth promoting rhizobacteria including phosphate and potassium solubulizing bacteria maintains biochemical, metabolic functions in plants and also maintains soil fertility and soil health but lower phosphorus use efficiency limits crop yield and economic returns.Leaf chlorophyll concentration is an important parameter frequently measured as an indication of chloroplast development, photosynthetic capacity, leaf nitrogen content or general plant health (Ling *et al*. 2011).

## MATERIAL AND METHODS

A field experiment entitled "Influence of integrated weed management practices and bio-fertilizers on chlorophyll content of *kharif* soybean [*Glycine max (L.) Merill*] in southern Telangana agro- climatic zone"was conducted at the Agricultural College Farm, Rajendranagar, hyderabad during 2014 and 2015. The soil was sandy loam in texture having 7.8 pH and EC 0.21 d S $m^{-1}$. It was very poor in nutrient status with 0.35% OC and 226 kg $ha^{-1}$ available N, available P was 18 kg $ha^{-1}$and available K was 236 kg $ha^{-1}$. The layout was a split plot design. The main treatments were : (W1) Pre-emergence application of pendimethalin @ 1.0 kg a.i $ha^{-1}$ followed by hand weeding 25 DAS, (W2) Pre emergence application of pendimethalin @1.0 kg a.i $ha^{-1}$ followed by post-emergence application of imazethapyr @ 100 g a.i $ha^{-1}$+ quizalofop-p-ethyl @ 50 g a.i $ha^{-1}$ 25DAS, (W3) Pre–emergence application of pendimethalin @1.0 kg a.i $ha^{-1}$ followed by post-emergence application of odyssey i.e. imazethapyr + imazamox@ 70 g a.i $ha^{-1}$ at 25 DAS, (W4) Hand weeding at 25 and 45 DAS and (W5) un-weeded check. The sub plot treatments comprising of (F1) Recommended dose of fertilizers @ 30:60:40 kg $ha^{-1}$ NPK, (F2) RDF+ seed treatment with rhizobium @ 250g10$kg^{-1}$seed, (F3) RDF+seed treatment with rhizobium @ 250g10$kg^{-1}$ seed +

phosphate solubilizing bacteria @ 5 kg $ha^{-1}$ , (F4) RDF + seed treatment with rhizobium @ 250 g10 $kg^{-1}$ seed + phosphate solubilizing bacteria @ 5 kg $ha^{-1}$ + potassium solubilizing bacteria@ 5kg $ha^{-1}$. Recommended fertilizer dose of 30:60:40 kg $ha^{-1}$ NPK was calculated for the dimensions of each sub plot and applied at the time of sowing in the form of urea. Single super phosphate and muriate of potash. Seed rate was @ 63 kg $ha^{-1}$. The bio fertilizers- *brady rhizobium japonica* and phosphate solubilising bacteria were mixed as per the treatment in jaggery solution prepared @ 250 g for 10 kg seed. The seed was thoroughly mixed with the solution and shade dried. The potassium solubilising bacteria were applied @ 5 kg $ha^{-1}$ after mixing with FYM. The seeds were dibbled at the rate of two per hill 10 cm apart in 30cm interval. The crop was sown on 10th July in 2014 and 18 th June in 2015. The SPAD-502 meter was used to record the readings on 10 green leaves from 5 plants in each treatment. The measurements were made on 30, 60 DAS and at harvest. The instrument measures the transmission of red light at 650 nm at which chlorophyll absorbs light and transmission of infra red light at 940 nm at which no absorption occurs.

The chlorophyll concentration was measured from the SPAD values developed by Ling *et al.,* 2011. The total chlorophyll per unit area ( n moles $cm^{-2}$ ) was worked out from the equation $Y= 0.0419x^2 + 1.6475x + 1.5239$ and $R^2=0.99$.

The chlorophyll concentration (n moles $mg^{-1}$) fresh weight of leaf tissue was obtained from the relationship $Y= 0.0007 x^2 + 0.0230 x+ 0.0544$ and $R^2=0.9809$

## RESULTS AND DISCUSSIONS

The results obtained in the field experiment entitled"Influence of integrated weed management practices and biofertilizers on chlorophyll content of *kharif* soybean [*Glycine max (L.) Merill*] in southern Telangana agro- climatic zone". Leaf chlorophyll concentration is an important parameter frequently measured as an indication of chloroplast development, photosynthetic capacity, leaf nitrogen content or general plant health . In the present investigation, the chlorophyll content $cm^{-2}$ and $mg^{-1}$ fresh weight of green leaves exhibited significant differences due to weed management treatments at the crucial pod formation and development stage of the crop at 60 DAS (Table 4.13).Maximum chlorophyll of 139.11 n mole $cm^{-2}$ and 2.16 n mole $mg^{-1}$ fresh weights of leaves were recorded in the un-weeded check during 2014.The chlorophyll content was 142.33 n mole $cm^{-2}$ and 2.22 n mole $mg^{-1}$ fresh leaf weights in this treatment during 2015. These values were not significantly different from hand weeding on 25 and 45 DAS. The chlorophyll content based on the leaf area and fresh weights was on par due to integrated weed management by the pre-emergence application of pendimethalin @ 1.0 kg *a.i* $ha^{-1}$ and hand weeding with these treatments. Complete dependence on the use of herbicides deterred the chlorophyll content. The pre-emergence application of pendimethalin @1.0 kg *a.i* $ha^{-1}$followed by post emergence application of imazethapyr @ 100 g *a.i* $ha^{-1}$ combined with quizalofop-p-ethyl @ 50 g *a.i* $ha^{-1}$ significantly reduced the leaf chlorophyll to 124.68 and 126.34 n mole $cm^{-2}$ during 2014 and 2015. It measured 1.93 and 1.96 n mole $mg^{-1}$ fresh weight during the corresponding years. Similarly, application of pre-emergence application of pendimethalin @1.0 kg *a.i* $ha^{-1}$ followed by post emergence application of odyssey @ 70 g *a.i* $ha^{-1}$ drastically reduced the chlorophyll to 128.90 and 131.62 n moles $cm^{-2}$ and to 2.00 and 2.04 n mole $mg^{-1}$ fresh weight during the two years. Chamate *et al*. (2002) also reported that the chlorophyll per cent in leaves did not vary significantly due to weed management treatments and the un-weeded check at 25 and 50 DAS.

The application of recommended dose of 30:60:40 kg $ha^{-1}$ $N:P_2O_5:K_2O$ led to the chlorophyll assimilation to 129.49 and 129.66 n mole $cm^{-2}$at 60 days during 2014 and 2015. The chlorophyll content was 2.01 n moles $mg^{-1}$ fresh weight of leaf during both years. The chlorophyll improvement owing to the inoculation of *Rhizobium*, *pseudomona*s and potassium solubilizing bacteria to 137.65 and 141.51 n mole $cm^{-2}$ ; 2.14 and 2.20 n mole $mg^{-1}$ fresh weight was not significant over the fertilizers. The results indicated that the optimum dose of fertilizer application was enough to accumulation sufficient chlorophyll in the leaves. The interaction due to weed and nutrient management treatments were not significant.

**Table 1. Chlorophyll content (n mole $cm^{-2}$) and {n mole $mg^{-1}$ fresh weight} as influenced by weed management treatments and bio-fertilizers during 2014 and 2015**

| Treatment | 2014 | | | 2015 | | |
|---|---|---|---|---|---|---|
| | 30 DAS | 60 DAS | At Harvest | 30 DAS | 60 DAS | At Harvest |
| **Weed Management** | | | | | | |
| W1:PE Pendimethalin @1kg *a.i* $ha^{-1}$fb Hand weeding at 25 DAS | 28.09 (80.92) {1.25} | 40.54 (137.35) {2.14} | 50.97 (194.55) {3.04} | 27.49 (78.67) {1.22} | 40.58 (137.58) {2.14} | 51.67 (198.61) {3.11} |
| W2:PE Pendimethalin @1kg *a.i* $ha^{-1}$fb PoE Imazethapyr @100 g *a.i* $ha^{-1}$+ Quizalofop- P-ethyl @50 g *a.i* $ha^{-1}$ 25 DAS | 26.65 (75.43) {1.16} | 37.95 (124.68) {1.93} | 51.20 (195.84) {3.07} | 26.93 (76.53) {1.18} | 38.29 (126.34) {1.96} | 51.70 (198.84) {3.11} |
| W3:PE Pendimethalin @1kg *a.i* $ha^{-1}$fb PoE Imazethapyr + Imazamox@ 70 g *a.i* $ha^{-1}$ 25DAS | 27.41 (78.34) {1.21} | 38.83 (128.90) {2.00} | 51.19 (195.82) {3.06} | 27.72 (79.50) {1.23} | 39.37 (131.62) {2.04} | 50.83 (193.66) {3.03} |
| W4: Hand weeding at 25 and 45 DAS | 28.41 (82.28) {1.27} | 40.72 (138.17) {2.15} | 50.92 (194.20) {3.04} | 28.59 (82.06) {1.28} | 41.20 (140.66) {2.19} | 51.07 (195.11) {3.05} |
| W5: Unweeded check | 25.90 (72.61) {1.12} | 40.87 (139.11) {2.16} | 51.01 (194.71) {3.05} | 25.83 (72.24) {1.12} | 41.50 (142.33) {2.22} | 51.24 (196.11) {3.07} |
| SE± | 4.44 | 2.77 | 3.08 | 3.98 | 3.13 | 3.21 |
| CD (P=0.05) | NS | 6.4 | NS | NS | 7.3 | NS |
| SE± | 0.06 | 0.04 | 0.04 | 0.06 | 0.05 | 0.05 |
| CD (P=0.05) | NS | 0.10 | NS | NS | 0.11 | NS |
| **Bio-fertilizers** | | | | | | |
| F1: Fertilizers @ 30:60:40 kg $ha^{-1}$ N:$P_2O_5$:$K_2O$ | 27.04 (76.87) {1.19} | 38.93 (129.49) {2.01} | 51.00 (194.78) {3.05} | 26.36 (74.25) {1.15} | 38.96 (129.66) {2.01} | 50.83 (193.79) {3.03} |
| F2: F1 + Rhizobium @250g 10 $kg^{-1}$ seed | 26.99 (76.67) {1.18} | 39.20 (130.83) {2.03} | 51.05 (195.05) {3.05} | 27.21 (77.54) {1.20} | 39.70 (133.35) {2.07} | 51.18 (195.80) {3.06} |
| F3:F2 + Phosphate solubilising bacteria@ 5 kg $ha^{-1}$ | 27.54 (78.86) {1.22} | 40.40 (136.61) {2.12} | 50.82 (193.48) {3.03} | 27.71 (79.49) {1.23} | 40.73 (138.31) {2.15} | 51.44 (197.22) {3.09} |
| F4:F3+ Potassium solubilising bacteria @ 5 kg $ha^{-1}$ | 27.60 (79.24) {1.22} | 40.61 (137.65) {2.14} | 51.37 (196.80) {3.08} | 27.97 (80.71) {1.25} | 41.36 (141.51) {2.20} | 51.75 (199.05) {3.11} |
| SE± | 3.12 | 4.31 | 4.15 | 3.37 | 4.50 | 4.12 |
| CD(P=0.05) | NS | NS | NS | NS | NS | NS |
| SE± | 0.04 | 0.06 | 0.06 | 0.05 | 0.07 | 0.06 |
| CD(P=0.05) | NS | NS | NS | NS | NS | NS |
| **Weed Management x Bio-fertilizer** | | | | | | |
| SE± | 6.99 | 9.64 | 9.29 | 7.55 | 10.06 | 9.22 |
| CD(P=0.05) | NS | NS | NS | NS | NS | NS |
| SE± | 0.10 | 0.15 | 0.14 | 0.11 | 0.15 | 0.14 |
| CD(P=0.05) | NS | NS | NS | NS | NS | NS |

Figures outside the brackets are SPAD values

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