SHORT COMMUNICATION

IMPACT OF WEED MANAGEMENT PRACTICES ON WEED CONTROL, NODULATION, RHIZOBIUM POPULATION AND YIELD IN SOYBEAN

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Absract: The experiment using JS 97-52 variety of soybean was laid out during *kharif* season of 2013 at the Research Cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) using Randomized Block Design, comprising four replications and eight treatments. The result revealed that highest number of root nodules plant^{-1} was recorded under hand weeding twice at 20 and 40 DAS, however it was found comparable with Sulfentrazone @ 300 g *a.i.* ha^{-1}as PE + Imazethapyr @ 100 g *a.i.* ha^{-1} as PoE. The lowest root nodules plant^{-1} was registered under untreated control. Maximum dry weight of nodules plant^{-1} was recorded under hand weeding twice at 20 and 40 DAS as compared to other treatments, however it was on par with Sulfentrazone @ 360 g *a.i.* ha^{-1} as PE and Sulfentrazone @ 300 g *a.i.* ha^{-1}as PE + Imazethapyr @ 100g *a.i.* ha^{-1} as PoE . The lowest weight of root nodules plant^{-1} was registered under untreated control. Maximum rhizobial population was observed under treatment untreated control, which was at par with treatment hand weeding twice at 20 and 40 DAS, and minimum rhizobial population was observed under treatment Pendimethalin @ 1 kg *a.i.* ha^{-1} as pre-emergence.Minimum density and dry weight of weeds were also registered under Hand weeding twice at 20 and 40 DAS.

Keywords: Nodule number, rhizobium population, weed control, soybean

INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is an important oil-yielding leguminous crop having multiple uses. Due to its various uses soybean is rightly called **"Golden Gift"** of nature to mankind. Soybean known as a **'Miracle Crop'** because it contains about 40-42 per cent high quality protein, 20-22 per cent edible oil, 20-30 per cent carbohydrates, large amount of phosphorus, high level of amino acids such as Lysine, Lucien, Lecithin and vitamins. Soybean builds up the soil fertility by fixing atmospheric nitrogen (45 to 60 kg ha^{-1}) through the root nodules, and adds about 0.5 to 1.5 tonnes ha^{-1} organic matter in soil through leaf fall (Kanase *et al*., 2006). It is able to leave residual nitrogen effect for succeeding crop equivalent to 35-40 kg N ha.$^{-1}$ Soybean can tolerate mild drought as well as floods. This characteristic has made soybean to fit well in sustainable agriculture.At Raipur (C.G) most prominent weeds observed in soybean *Echinochloa colona, Cyperus rotundus, Euphorbia spp., Commelina benghalensis, Phyllanthus niruri,* (Kolhe *et al et al.,* 1998).The critical period of crop-weed competition in soybean is reported to be first DAS (Swarnakar, 2010).In soybean, the weed flora as observed from the unweeded control plots consist of 58% sedges, 32% broad-leaved weeds and 10% grasses.Hand weeding is a traditional and effective method of weed control, but untimely and continuous rains as well as unavailability of labour at peak time are main limitations of manual weeding. The only alternative that needs to be explored is the use of pre as well as post-emergence herbicides. The screening of such herbicides in soybean reveals their efficiency against either monocotyledonous or dicotyledonous weeds. Many herbicides like sulfentrazone, and imazethapyr are available at present day giving effective and broad spectrum weed control in soybean. In the present study, an attempt was made to evaluate cultural practices and selective herbicides for the control of weeds and to find out the effect of weed-control methods on yield of soybean.

MATERIAL AND METHOD

A field experiment was conducted at Research Cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *kharif* seasons of 2013. The soil of experimental field was *clayey* in texture, low in nitrogen, medium in phosphorus and high in potassium contents with neutral pH. The experiment was laid out in Randomized Block Design, comprising four replication and eight treatments which included Sulfentrazone 48 % F 300 g *a.i* ha^{-1} as pre-emergance, Sulfentrazone 48 % F 360 g *a.i* ha^{-1}as pre- emergence, Pendimethalin 30 EC 1 kg *a.i* ha^{-1} as pre-emergence, Sulfentrazone 48 % F 300 g *a.i* ha^{-1} as pre -emergance + Imazethapyr 10 SL as Post-emergance, Sulfentrazone 48 % F 300 g *a.i* ha^{-1} as pre -emergance + one hand weeding , Sulfentrazone 48 % F 300 g *a.i* ha^{-1} as pre -emergance + hoeing , hand weeding twice at 20 and 40 DAS and untreated control . Soybean variety JS 97-52 was sown with spacing of 30 cm x 7cm during the last week of June and the seed rate of 83.33 kg ha^{-1} and fertilizer dose was 25, 60 and 40 kg/ ha of N, P_2O_5 and K_2O respectively was used, at the time of sowing. Yield attributes were recorded at harvest. Observations of weeds, number and dry weight of nodules were recorded at 60 DAS. Analysis of rhizobium population in soil was done by serial dilution plating method (Subba Rao 1988).

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RESULT AND DISCUSSION

Higher number of root nodules plant^{-1} was recorded under treatment twice hand weeding at 20 and 40 DAS (T_7) as compared to other treatments, however it was found comparable with Sulfentrazone @ 300 g *a.i.* ha^{-1}as PE + Imazethapyr @ 100g *a.i.* ha^{-1} as PoE (T_4). The lowest root nodules plant^{-1} was registered under untreated control (T_8).

Increased number of root nodules plant^{-1} in above treatments might be due to the favourable microclimate after suppression of weeds near the root zone of soybean crop. Higher nodulation fixed the atmospheric nitrogen which ultimately supported in higher crop growth of soybean. Increased number of nodules up to 60 DAS might be due to less weed and favourable micro climate. Furthermore, nodules count in the above treatments might be due to greater infection *Rhizobium* in the growing roots. Increased number of nodules up to 60 DAS might be due to less weed and favourable micro climate. Furthermore, nodules count in the above treatments might be due to greater infection *Rhizobium* in the growing roots. The increased in nodule number probably due to increased aeration of *Rhizosphere*. On the contrary, in rest of the treatments, limitation of soil moisture and nutrients for plant uptake, adversely affected the nodulation and decline nitrogenase activity.

Higher dry weight of nodules plant^{-1} was recorded under hand weeding twice at 20 and 40 DAS (T_7) as compared to other treatments, however it was on par with Sulfentrazone @ 360 g *a.i.* ha^{-1} as PE (T_2) and Sulfentrazone @ 300 g *a.i.* ha^{-1}as PE + Imazethapyr @ 100g *a.i.* ha^{-1} as PoE (T_4). The lowest weight of root nodules plant^{-1} was registered under untreated control (T_8). Increased dry weight of nodules in the above treatments might be due to more nodule count and greater infection of *Rhizobium* in the growing roots. Lowest dry weight of nodule might be due to more crop-weed competition and effect of herbicides.

Rhizobial population (x 10^6 g^{-1} soil) of soybean field was counted at 60 DAS and data are presented in Table 1. maximum rhizobial population was observed under treatment untreated control (T_8), which was at par with treatment hand weeding twice at 20 and 40 DAS (T_7), whereas significantly minimum rhizobial population was observed under treatment Pendimethalin @ 1 kg *a.i.* ha^{-1} as pre-emergence (T_3). The highest rhizobial population observed under untreated control (T_8) followed by hand weeding twice at 20 and 40 DAS (T_7), and incomparable treatments might be due to the favourable microclimate and absence of herbicidal effect. Lowest Rhizobial population was observed under Pendimethalin @ 1 kg *a.i.* ha^{-1} as pre-emergence (T_3) might be due to more crop-weed competition and herbicidal effects. Similar findings were reported by Jeenie and Sharma (2011).

The experimental site was dominated by *Parthenium hysterophorus, Euphorbia geniculata, Digera arvensis, Commelina benghalensis, Convolvulus arvensis, Echinocloa colona*, *Cynodon dactylon* and *Cyperus rotundus*. Density of weeds were observed significantly maximum under Untreated control and significantly minimum density was recorded under Hand Weeding twice at 20 and 40 DAS. This was because no any weed management practices was applied to control weeds under untreated control plot, which freely proliferated and compete with the crop for available nutrient, moisture and sunlight resulting in reduction of crop yield. Similar results were observed by Idapuganti *et al.* (2005) and Pal *et al* (2013). Dry matter production by weeds were observed significantly maximum under Untreated control and significantly minimum production of dry matter under treatment Hand weeding twice at 20 and 40 DAS. Idapuganti *et al.* (2005) and Karande *et al.* (2008) also reported similar results from their study. The total production of dry matter by weeds was significantly highest under Untreated control throughout the crop growth period, which was due to absence of suitable weed management practices, which leads to accumulation of more dry matter in weeds upto harvest.

Table 1: Effect of weed management practices on number and dry weight of nodules, rhizobium population, weed density and dry weight of weeds in soybean

Treatments	**Number of nodules plant^{-1}**	**Dry weight of nodules (g plant^{-1})**	**Rhizobium population (x 10^6 g^{-1} soil)**	**Weed density (No m^{-2})**	**Dry weight of weeds (g m^{-2})**
T_1-Sulfentrazone 48 % F @ 300 g a.i ha $^{-1}$ as PE	78.3	0.98	42	**6.1** (37.2)	**3.8** (14.2)
T_2-Sulfentrazone 48 % F@ 360 g a.i ha $^{-1}$ as PE	87.8	1.25	37	**5.9** (23.5)	**3.1** (9.6)
T_3- Pendimethalin 30 EC @ 1 kg a.i ha $^{-1}$ as PE	73.8	0.86	32	**8.2** (66.4)	**5.2** (28.9)
T_4- Sulfentrazone 48 % F @ 300 g a.i ha $^{-1}$ as PE fb	97.3	1.19	26	**2.8** (7.2)	**2.0** (3.9)

Imazethapyr 10 SL @ 100 g a.i ha $^{-1}$ as PoE					
T_5-Sulfentrazone 48 % F@ 300g a.i ha $^{-1}$ as PE fb One Hand Weeding at 25 DAS	80.3	1.03	47	**5.4** (28.6)	**3.7** (13.2)
T_6-Sulfentrazone 48 % F@ 300 g a.i ha $^{-1}$ as PE fb Hoeing at 25 DAS	76.1	0.92	49	**6.6** (42.9)	**4.2** (17.4)
T_7-Hand weeding twice at 20 and 40 DAS	99.2	1.49	54	**2.5** (6)	**1.3** (1.2)
T_8-Untreated control	63.2	0.61	62	**12.3** (152.3)	**12.1** (147.7)
SEm ±	**0.8**	**0.12**	**1.7**	**1.9**	**2.3**
CD (P=0.05)	**2.8**	**0.43**	**5.1**	**5.6**	**6.7**

Figures in the parentheses are original values; data were transformed through $\sqrt{x+0.5}$ which are given in bold

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