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INFLUENCE OF IRRIGATION SCHEDULING AND WEED MANAGEMENT PRACTICES ON GROWTH ATTRIBUTES OF COWPEA

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ABSTRACT

Cowpea (*Vigna sinensis* L.) commonly known as "Lobia" is a minor pulse crop of India. Its green pods used for human consumption as vegetable and concentrated feed for cattle. This crop provides heavy vegetative growth and covers the ground so well that it effectively acts as weed smothering crop. A field experiment was carried out in the Annamalai University Experimental Farm, Annamalai nagar to evaluate irrigation scheduling and weed management practices on growth attributes of cowpea during February to May, 2017. Irrigation at 0.8 IW/CPE ratio along with pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS excelled other treatments by recording highest plant height, crop dry matter production, leaf area index and seed yield. Results of the field experiment revealed that irrigation at 0.8 IW/CPE ratio combined with pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS is an economically viable and efficient practice for enhancing the growth and yield of cowpea.

***Keywords*:** Irrigation scheduling, weed control index, growth attributes and seed yield.

INTRODUCTION

The pulses constitute an important group of crops and have been the main stay in Indian agriculture. Pulses are cheaper than meat; they are often referred as 'poor man's meat' in developing countries. Among different pulses grown in the world, cowpea is grown in 14 million hectares with production of 4.5 million tonnes in 2010 for human consumption and the productivity of 387 kg ha^{-1} (FAOSTAT, 2013). In India, it is cultivated in 654 lakh hectares with an annual production of 599 lakh tonnes leading to average productivity of 916 kg ha^{-1} (Anonymous, 2015). In terms of agriculture, their role is to supress weeds, acts as 'N' source, builds soil and prevents soil erosion, used as cover crop to prevent soil moisture loss and also used for forage purposes. The benefits of cowpea are weed smothering biomass, quick green manure crop and also as companion crop, it needs with low moisture.

According to Anita and Lakshmi (2015) reported that the avoidance of moisture stress, at all its critical stages, enhances the growth and development of the crop. Since water is one of the precious, essential as well as costly inputs it is necessary to find out the judicious water management practices. The latest method of irrigation scheduling was based on the Climatological approach as it referred to the growth and yield attributes of cowpea were significantly influenced by frequent irrigation at 0.8 IW/CPE ratio (Dasila *et al*., 2016). Besides these, cowpea competes poorly with weeds in its emerging stage. This is made under irrigation where adequate moisture supply encourages the rapid growth of weeds. Hence by reducing the weed interference at the initial period of crop growth with pre-emergence application of pendimethalin (2.0 litres ha^{-1}) at 3 days + One hand weeding at 30 days was significantly reducing the weed population, dry matter and that enhances the yield of the crop (Mekonnen and Dessie, 2016). Continuous use of herbicides over a prolonged period leads to development of resistance in weeds making them difficult to control. Hence, the herbicides with mechanical or cultural weeding are effective in controlling major weeds. Though herbicides are fast replacing the traditional methods, hand weeding in India is still adopted by farmers as an effective weed control method. According to Yadav *et al.* (2017) hand weeding twice provides highest seed yield with the low in total weed population thus provides the crop with comparatively stress free environment. Thus, it is necessary to integrate the chemical and mechanical method of weed control which is eco-friendly and economically viable.

To enhance the growth and yield attributes of cowpea, the crop should be supplied with all the adequate resources such as soil moisture, nutrients with weed, pest and disease free environment. This probably increases the yield of the crop. Hence, irrigating the crop with proper integrated weed control measures gives the highest economic returns in cowpea (Na-Allah *et al.,* 2017).

MATERIALS AND METHODS

A Field experiment was conducted during February to May, 2017 to study the evaluation of irrigation scheduling and weed management practices on growth and yield of cowpea. The field experiment was laid out in Split-plot design with replicated thrice. The experiment comprises of four main plot treatments viz., M_1–Control, M_2 – Irrigation at 0.4 IW/ CPE ratio, M_3 – Irrigation at 0.6 IW/ CPE ratio and M_4 – Irrigation at 0.8 IW/ CPE ratio and five sub plot treatments viz., S_1 – Unweeded control, S_2 – Hand weeding twice at 15 and 30 DAS, S_3 – Pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1}, S_4 - Pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS and S_5 - Pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + Imazethapyr at 0.075 kg a.i. ha^{-1}. The soil texture of the experimental field was clay loam. The soil was low in available nitrogen (200.00 kg ha^{-1}), medium in available phosphorous (18.50 kg ha^{-1}) and high in available potassium (320.00 kg ha^{-1}). The variety Co(CP)7 seeds were dibbled by adopting 45cm spacing between rows and 15cm within the rows with the fertilizer schedule of 25: 50: 25 kgs of NPK ha^{-1}. Life irrigation was given immediately after sowing with due care to avoid excess flooding of water. Subsequent irrigation was given based on the IW/CPE ratio which is fixed as control, 0.4, 0.6, and 0.8 with cumulative pan evaporation reading till the crop maturity. As per the treatment schedule, required quantity of herbicide pendimethalin 38.7 % CS as pre-emergence on 3 DAS and Imazethapyr 10 % SL as post-emergence on 25 DAS were sprayed by knapsacks sprayer fitted with flood jet nozzle using 500 litres of water ha^{-1} with adequate soil moisture. Weed control index, plant height, crop dry matter production, leaf area index, seed yield and water use efficiency was calculated.

RESULTS AND DISCUSSION

Plant height

Among the main plot treatments, irrigation at IW/CPE ratio of 0.8 recorded the highest plant height. With the sub plot treatments, the highest plant height was recorded with the pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS. In respect to interaction effect irrigation at IW/CPE ratio of 0.8 with the pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS performed better with higher and comparable plant height and yield. The better performances of the treatment could be attributed to efficient control of weeds. Further, enhanced crop vigour due to better nutrient mobility, pest and disease control might have also contributed for the significant interaction imparting better weed control (Sanging *et al.,* 2002).

Crop dry matter production

Among the main plot treatments, highest crop dry matter production was recorded at IW/CPE ratio of 0.8. With the sub plot treatments, the pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS recorded the highest crop dry matter production in comparison with other treatments. The integrated treatments of irrigation at IW/CPE ratio of 0.8 with pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS recorded the highest dry matter production of cowpea. This finding was in accordance with Chattha *et al.* (2007) who found that lowest weed density, highest weed control index, growth attributes and seed yield could be obtained with this integrated treatments.

Leaf area index

With respect to the irrigation schedule, Irrigation at IW/CPE ratio of 0.8 recorded the highest LAI followed by irrigation at IW/CPE ratio of 0.6 and control. In respect of weed management practices, the pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS recorded the highest LAI. The least leaf area index was observed in unweeded control. The interaction effect was found to be significant in influencing the LAI on cowpea. On 30 DAS, Irrigation at IW/CPE ratio of 0.8 combined with pre-emergence application of pendimethalin 38.7% CS at 0.70 kg a.i. ha^{-1} + One hand weeding at 30 DAS recorded the highest LAI. The least LAI was recorded with irrigation at IW/CPE ratio of 0.4 with unweeded control. The increase in growth attributes of cowpea by proper weed control measures that suppress all the weed population in the field and reduces the weed competition with the crop as this was reported by Rao and Shahid (2011).

Seed yield

Among the main plot treatments, Irrigation at IW/CPE ratio of 0.8 was recorded the highest seed yield. This was followed by Irrigation at IW/CPE ratio of 0.6. In respect of sub plot treatments, Pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i ha^{-1}+ one hand weeding at 30 DAS performed superior by registering the highest seed yield. This was on par with hand weeding twice at 15 and 30 DAS. The Interaction effect, Irrigation at 0.8 IW/CPE ratio combined with Pre-emergence application of pendimethalin 38.7 % CS at 0.70 kg a.i ha^{-1}+ one hand weeding at 30 DAS was recorded the highest seed yield. The interaction proved significantly because of the suppression of weed growth by better growth of the crop and supplement by the weed control measures during cropping season and could resulted in additive or synergistic weed control. These results were in conformity with the findings of Srivastava *et al.* (2015).

Table 1 : Effect of the treatments on growth attributes of cowpea

S. No	Treatments	Plant height at 30 DAS (cm)	Crop dry matter production at 30 DAS (kg ha^{-1})	Leaf area index at 30 DAS
M_1	Control	17.08	255.05	0.26
M_2	Irrigation at 0.4 IW / CPE ratio	14.05	225.05	0.20
M_3	Irrigation at 0.6 IW / CPE ratio	17.12	255.68	0.26
M_4	Irrigation at 0.8 IW / CPE ratio	21.15	344.27	0.37
	S.Ed	0.48	12.07	0.02
	CD(p=0.05)	1.18	29.54	0.04
S_1	Unweeded control	11.59	173.30	0.17
S_2	Hand weeding twice at 15 and 30 DAS	18.82	301.48	0.32
S_3	Pre - emergence application of Pendimethalin 38.7 % CS @ 0.70 Kg a.i. ha^{-1}	15.57	221.74	0.22
S_4	Pre - emergence application of Pendimethalin 38.7 % CS @ 0.70 Kg a.i.ha^{-1} + One hand weeding (30 DAS)	25.20	432.84	0.42
S_5	Pre - emergence application of Pendimethalin 38.7 % CS @ 0.70 Kg a.i. ha^{-1} + Post-emergence application of Imazethapyr @ 0.075 Kg a.i. ha^{-1}	15.58	220.68	0.23
	S.Ed	1.16	17.02	0.02
	CD(p=0.05)	2.36	34.67	0.04

Table 2 : Effect of the treatments on seed yield of cowpea

S.No	Treatments	Seed yield (Kg ha^{-1})
M_1	Control	943.40
M_2	Irrigation at 0.4 IW / CPE ratio	784.40
M_3	Irrigation at 0.6 IW / CPE ratio	963.40
M_4	Irrigation at 0.8 IW / CPE ratio	1230.80
	S.Ed	37.67
	CD(p=0.05)	92.18
S_1	Unweeded control	658.00
S_2	Hand weeding twice at 15 and 30 DAS	1216.75
S_3	Pre - emergence application of Pendimethalin 38.7 % CS @ 0.70 Kg a.i. ha^{-1}	863.25
S_4	Pre - emergence application of Pendimethalin 38.7 % CS @ 0.70 Kg a.i.ha^{-1} + One hand weeding (30 DAS)	1220.50
S_5	Pre - emergence application of Pendimethalin 38.7 % CS @ 0.70 Kg a.i. ha^{-1} + Post-emergence application of Imazethapyr @ 0.075 Kg a.i. ha^{-1}	996.00
	S.Ed	52.52
	CD(p=0.05)	106.97

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REFERENCES

Anita, M.R. and Lakshmi, S. (2015) Growth characters of fodder cowpea varieties as influenced by soil moisture stress levels. *Indian J. Agric. Res.,* 49(5): 464-467.

Anonymous (2015). Area, Production and Productivity of cowpea. Indian Pulse Research Institute, Kanpur.

Chatta, R.M.; Jamil, M. and Mahamood, T. (2007). Yield and yield component of cowpea as affected by various weed control method under rainfall condition of Pakistan. *Int. J. Agric. Biol,* 9: 120-124.

Dasila, B.; Singh, V.; Kushwala, H.S.; Srivastava, A. and Ram, S. (2016). Water Use Efficiency and yield of cowpea and nutrient loss in lysimeter experiment under varying water table depth, irrigation schedules and irrigation method. *SAARC J. Agric.,* 14(2): 46-55.

FAOSTAT (2013) Agricultural Production. Food and Agriculture Organization of the United Nations.http://www.faostat.fao.org.Cited 26 April 2010.

Mekonnen, G. and Dessie, M. (2016) Effect of pre-emergence herbicides on weeds, nodulation and yield of cowpea (*Vigna ungiuculata L. Walp.*) at Haik and Mersa in Wollo, Northern Ethiopia. *Int. J. App. Agric. Sci.,* 2(6): 99-111.

Na-Allah, M.S.; Mukhtar, A.A.; Mahadi, M.A.; Tanimu, M.U. and Muhammad, A. (2017). Performance of cowpea (*Vigna unguiculata L. Walp.*) under irrigation as influenced by weed management methods and intra row spacing. *J. Agric. Sci. Pract.,* 2: 58-65.

Rao, N.K. and Shahid, M. (2011). Potential of cowpea (*Vigna unguilata* (L.) Walp.) and guar (*Cyamopsis tetragonoloba* (L.) Taub.) as alternative forage legumes for the United Arab Emirates. *Emirates J. Food Agric.,* 23(2): 147-156.

Sanging, N.G.; Tholta, P. and Dashiell, K. (2002) Effectiveness of rhizobia nodulating recent promiscuous soybean selections in the moist savannah of Nigeria. *Soil Biol. Biochem.,* 32: 127-133.

Srivastava, A.; Dasila, B.; Singh, V.; Kushwala, H.S. and Ram, S. (2015). Water use efficiency and yield of cowpea and nutrient loss in lysimeter experiment under varying water table depth, irrigation schedules and irrigation method. *SAARC J. Agric.,* 14(1): 46-55.

Yadav, T.; Nisha, K.; Chopra, N.K.; Chopra, M.R.; Yadav, R.; Kumar, D.K.; Rathore, A.G.; Soni, G.; Makarana, A.; Tamta, M.; Kushwala, H.; Ram, R.K.; Meena and Singh, M. (2017) Weed management in cowpea – A review. *Int. J. Curr. Microbiol. App. Sci.,* 6(2): 1373-1385.