Influence of irrigation schedules based on IW:CPE ratios and herbicidal weed control in isabgul (Plantago ovata Forsk)

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ABSTRACT
Application of isoproturon was most effective for the control of all weeds, which resulted in 99.32%. weed control efficiency and 49.00% higher mean seed yield over unweeded control. The higher WUE (3.606 kg ha\(^{-1}\) mm\(^{-1}\)) was observed under 0.4 IW:CPE ratio and higher net return (Rs ha\(^{-1}\) 28904) were obtained under the treatment combination (0.4 IW:CPE ratio and application of isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence). The interaction effect of irrigation schedule and herbicidal weed control practices was found non-significant in some cases.

Key words: Isabgul, Plantago ovata, Blonde psyllium, Irrigation, IW:CPE ratio, Herbicide

INTRODUCTION
Blonde psyllium (Plantago ovata Forsk) is an important medicinal crop of Gujarat. Due to low cost of production and higher return from the crop. Gujarat commands near monopoly in the production and export of isabgul seed and seed husk to the world market. It is cultivated in India about 1.3 lakh ha with production 77000 MT seed. (Desai and Devra, 2008). Earning about 130 crores rupees from the isabgul seed and 150 crores rupees from husk were exported valued together Rs.280 crores. Isabgul is raised as a rabi season crop and grown in all type of soil under irrigated conditions but does best on loamy soils. Water is scare commodity, which if used judiciously along with suitable agrotechniques would substantially increase both plant growth, yield and yield attributes. With the introduction of high yielding varieties coupled with increased use of fertilizers and irrigation on weed problem have increased manifold. Application of irrigation in proper amount and in proper time will go a long way in arresting the problem created by weeds. The predominant method of weed control by mechanical hoeing and manual weeding is found to be laborious and time consuming not only this but in peak period of crop growth. Labour is not easily available. Under these situations the chemical control of weeds is found to be effective and economical. Establishing proper herbicidal weed control and irrigation scheduling can enhance the productivity of isabgul. With these dual purpose agronomic aspects in mind, an attempt has been made to conduct an experiment on “Influence of irrigation schedules based on IW:CPE ratios and herbicidal weed control in isabgul (Plantago ovata Forsk).

MATERIALS AND METHODS
A field experiment was conducted during winter seasons of 2006-07 at College Agronomy Farm, B.A. College of Agriculture, Anand Agricultural University, Anand. The soil was sandy loam in texture. Low in organic carbon, available potassium with pH 7.8. The treatment consisted of four irrigation schedules based on IW:CPE ratios and four herbicidal weed control practices. The experiment was laid out in split plot design with allocation of irrigation schedule in main plots and herbicidal weed control in sub-plots. The treatments were replicated four times. Isoproturon and oxadiargyl were applied @ 0.5 kg ha\(^{-1}\) as pre-emergence and post-emergence, respectively, in 500 liter ha\(^{-1}\) of water. Isabgul variety GI-2 was sown by broadcasting the seeds on November 15, 2006, at 4.0 kg seed ha\(^{-1}\) and fertilized with 30+15 kg NP ha\(^{-1}\).

RESULTS AND DISCUSSION
The results obtained from the present investigation are present below:

Effect on weeds:
The major weeds observed in the experimental field were Chenopodium album (32.1%) Chenopodium murale (18.8%), Argemone mexicana (8.0%), Tribulus terrestris (10.6%), Cyperus rotundus (14.0%), other weeds with low density (16.5%) were Eragrotis major Rome and Sch., Dactyloc tenium aegyptium, Eleusine indica, phyllanthus niruri, Argemone mexicana and Cynodon dactylon. Weed density at 15 DAS was not influenced by different irrigation schedules. Irrigation at 0.4 IW:CPE ratio accounted for the significantly lowest weeds while, significantly lower total weed count was noticed under irrigation schedule I\(_2\) (0.4 IW:CPE ratio) at 30 DAS. At 60 DAS both (I\(_1\)) and (I\(_2\)) contributed lower total weed counts. The irrigation schedule I\(_1\) (0.4 IW:CPE ratio) had the highest weed density at 15 and 30 DAS.
ratio) accounted for the significantly the lowest number of dicot and total weed count at harvest, though the weed dry weight was not significantly influenced by the number of irrigations at 30 DAS and at harvest but, at 60 DAS significantly lower dry weight of weeds was observed with irrigation schedule I₁ (0.4 IW:CPE ratio) and I₄ (flood irrigation-one month interval between two irrigation), respectively. Isoproturon @ 0.5 kg ha⁻¹ caused lower weed density and weed dry weight than oxadiaryl @ 0.5 kg ha⁻¹ (Table 1).

Effect on crop:

Irrigation schedules (0.4 IW:CPE ratio) and (Flood irrigation-one month interval between two irrigation) significantly influenced the growth attributes of isabgul. Weight of 1000 seed was found non-significant by irrigation schedules (Table 2).

Herbicidal weed control practices significantly affected the yield attributes of isabgul. Maximum values of all the yield attributes were recorded under isoproturon application and minimum under unweeded control. Reduced crop-weed competition due to isoproturon created a favorable condition for better crop growth and development (Table 2).

Seed yield, straw yield and harvest index of isabgul were influenced by irrigation schedules. Significantly higher seed yield, straw yield and harvest index were recorded when irrigations were done at 0.4 IW:CPE ratio. All the weed control treatments produced...
significantly higher seed and straw yield except unweeded control (Table 2). Higher harvest index was observed under hand weeding at 20 and 40 DAS followed by isoproturon at 0.5 ka ha\(^{-1}\). Isoproturon at 0.5 ka ha\(^{-1}\) was most effective in reducing crop-weed competition and producing higher 1000 seed weight and seed yield. The highest seed yield due to herbicide (isoproturon) in isabgul was also reported by Mehta et al. (1985), Patel et al. (1996), Parihar and Singh (2001) and Patel and Mehta (1990).

Interaction effect between irrigation schedules and herbicidal weed control practices were found significant at all stages of weed counts except weed counts at 15 DAS. The non-significant results were observed for dry weight of weeds at 30 DAS and at harvest but significant at 60 DAS. The plant height, Total tillers per plant, Length of spike, Straw yield, Seed yield and Harvest index were influenced by irrigation schedules and herbicidal weed control treatments.

The highest consumptive use of water was observed under treatment I\(_4\) (0.8 IW:CPE ratio) followed by treatment I\(_3\) (0.6 IW:CPE ratio). The highest water use efficiency was recorded under treatment I\(_i\) (0.4 IW:CPE ratio) followed by treatment I\(_1\) (Flood irrigation-one month interval between two irrigation). The maximum water expanse efficiency was noted under the I\(_1\) (0.4 IW:CPE ratio) followed by I\(_4\) (Flood irrigation-one month interval between two irrigation) (Table 3). Treatment W\(_1\) (Isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence) and W\(_2\) (Unweeded control) had registered higher consumptive use of water. The highest water use efficiency was observed under W\(_i\) followed by W\(_3\). The highest WEE was observed under the treatment W\(_3\) followed by W\(_1\) (Table 3). Maximum WUE was observed under the treatment hand weeding at 20 and 40 DAS and isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence. This might be due to minimum transpiration loss of water through weeds. This was effectively controlled by isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence.

**Economics:**

The treatment combination I\(_4\)W\(_3\) (flood irrigation-one month interval between two irrigation and isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence) and W\(_3\) (Isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence) and W\(_2\) (Unweeded control) had registered higher consumptive use of water. The highest water use efficiency was observed under W\(_i\) followed by W\(_3\). The highest WEE was observed under the treatment W\(_3\) followed by W\(_1\) (Table 3). Maximum WUE was observed under the treatment hand weeding at 20 and 40 DAS and isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence. This might be due to minimum transpiration loss of water through weeds. This was effectively controlled by isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence.
emergence) had given the highest net returns, ICBR and net ICBR (29279, 1:46.14, 1:45.14, respectively). The second best treatment combination was I \(_1\)W \(_3\) (0.4 IW:CPE ratio and isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence) with net realization (28904), ICBR (1:45.42) and net ICBR (1:44.42) (Table 4).

**Conclusion:**

Thus, from the point of view of productivity and economics, the isabgul crop should be irrigated either on the basis of (0.4 IW:CPE ratio) or (Flood irrigation-one month interval between two irrigation) to obtain higher yield and net returns. Maintaining a weed free plot with the application of isoproturon @ 0.5 kg ha\(^{-1}\) as pre-emergence could preferred for Gujarat soil for achieving highest yield and remuneration.

**References**


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