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Dr. Rajesh Dutt Singh
Assistant Professor (Agronomy),
K.N.I.P.S.S., Sultanpur, Uttar
Pradesh, India

Dr. VK Singh
Associate Professor (Agronomy),
B.M. Rath Hamirpur, Himachal
Pradesh, India

Ghanshyam Dwivedi
Assistant Professor (Agronomy),
K.N.I.P.S.S., Sultanpur, Uttar
Pradesh, India

Weed management studies in chickpea (*Cicer arietinum* L.) under varying levels of phosphorus in Bundelkhand region of southern U.P.

Dr. Rajesh Dutt Singh, Dr. VK Singh and Ghanshyam Dwivedi

Abstract

A field experiment was conducted during 2004-05 & 2005-06 at research farm of Brahamanand Mahavidyalaya, Rath (Hamirpur) University of Bundelkhand, Jhansi (U.P.), to find out weed management studies in Chickpea under varying levels of phosphorus in Bundelkhand region of Southern U.P. At the inception of the experiment, the soil was low in organic carbon & available nitrogen, medium in phosphorus & potassium. On the basis of results obtained in the present study conducted for two consecutive years, the following conclusions are being made out which could be useful for both scientists & farmers. The next best treatment to weed free was the integrated method of ween management i.e. pre-emergence application of Pendemethalin @ 1.0 kg a.i. ha⁻¹ + HW at 48 DAS in respect of providing better yield & yield contributing characters and for effective.

Keywords: Weed management, chickpea, phosphorus in Bundelkhand.

1. Introduction

The field experiment entitled "Weed management studies in chickpea (*Cicer arietinum* L.) under varying levels of phosphorus in Bundelkhand region of southern U.P." was conducted in split spot design with three replications during two consecutive *Rabi* seasons of 2004-05 and 2005-06 at Research Farm of Brahamanand Mahavidyalaya, Rath (Hamirpur) U.P., India. The experimental treatments included four levels of phosphorus (0, 30, 60 and 90 Kg ha⁻¹) as main plot treatments and 6 weed management practices (weedy, weed free, HW at 25 and 45 DAS, HW at 35 DAS, pendimethalin @ 1.0 kg a.i. ha⁻¹ pre-em. and pendimethalin @ 1.0 kg a.i. ha⁻¹ pre-em. + HW 45 DAS) as sub-plot treatments.

The soil of experimental filed was low in organic carbon and available nitrogen, medium in phosphorus and potatssium. The pH and EC of soil were 7.8 and 0.34 during 2004 and 7.8 and 0.38 during 2005, respectively. The sowing of the seeds of chickpea variety Avarodhi @ 80 kg ha⁻¹ was done in lines 30 cm apart on 26th November in both the year of study. The crop was irrigated once at pod formation stage during both the years of filed experimentation.

The result obtained are being summarized here after.

2 Studies on crop

2.1 Effect of Phosphorus

2.1.1 Pre-harvest studies

- Varying levels of phosphorus did not cause significant variations in plant population per unit area in both the years.
- Application of 90 kg P₂O₅ ha⁻¹ produced significantly the tallest during both the years of study. Differences in plant height recorded at 30th day stage of crop were not perceptible under the effects of varying phosphorus dosed in both the years.
- Application of 90 kg P₂O₅ ha⁻¹ during both the years at 60th day stage and with 30 and 60 kg P₂O₅ ha⁻¹ during second years at 90th day stage produced significantly the maximum number of branches plant⁻¹ during both the years of study. Differences in number of branches plant⁻¹ recorded at 30th day stage of crop was not perceptible under the effects of varying phosphorus doses in both the years.
- Significantly the maximum nodules plant⁻¹ was counted under the effect of 90 kg P₂O₅ ha⁻¹ as compared with its lower dosed during both the years of study.
- Application of 60 to 90 kg P₂O₅ ha⁻¹ provided the maximum chlorophyll content in fresh levels of crop during both the years of study.
- Significantly the highest dry weight plant⁻¹ was noted under the effect of 90 kg P₂O₅ ha⁻¹ as compared with its

Correspondence

Dr. Rajesh Dutt Singh
Assistant Professor (Agronomy),
K.N.I.P.S.S., Sultanpur, Uttar
Pradesh, India

lower dosed but was statistically equal to 30 and 60 kg P₂O₅ ha⁻¹ during first years at 30th day stage and to 60 kg P₂O₅ ha⁻¹ during first year at both 60th day and harvest stage or crop growth.

- The differences in plant population recorded at harvest due to varying phosphorus doses was not perceptible during both the years of study.
- Differences in days taken to 50% flowering and 50% maturity recorded under the effect of varying phosphorus doses was not perceptible during both the year of experimentation.

2.1.2 Post harvest studies

- Significantly the maximum number of pods plant⁻¹ was associated with 90 kg P₂O₅ ha⁻¹ during both the years of study, but was comparable with 60 kg P₂O₅ ha⁻¹ during first year only.
- Application of 90 kg P₂O₅ ha⁻¹ surpassed its lower doses in respect of providing more number of grains pod⁻¹ during both the years of study.
- Grain weight plant⁻¹ increased consistently with increasing doses of phosphorus and was maximum with 90 kg P₂O₅ ha⁻¹ during both the year of study.
- Application of 90 kg P₂O₅ ha⁻¹ although did not differ significantly from its lower dose of 60 kg P₂O₅ ha⁻¹ registered the highest test weight as compared with 30 and 0 kg P₂O₅ ha⁻¹ in both the years of study.
- Significantly the highest grain yield was recorded by 90 kg P₂O₅ ha⁻¹ as compared with its lower doses during both the years of study. 90 kg P₂O₅ ha⁻¹ enhanced the crop yield by 41.25 and 38.22 percent over control during first and second years, respectively.
- Straw yield was the maximum under the effect of 90 kg P₂O₅ ha⁻¹ which was significantly higher than the remaining doses of phosphorus during both the years of study.
- Application of 90 kg P₂O₅ ha⁻¹ registered the highest values of harvest index followed by 60 kg P₂O₅ ha⁻¹ during both the years of study.
- The maximum protein content in grain was associated with 90 kg P₂O₅ ha⁻¹ followed by 60 kg P₂O₅ ha⁻¹ during both the years of study.
- The maximum N and P uptake was associated with 90 kg P₂O₅ ha⁻¹ followed by 60 kg P₂O₅ ha⁻¹ during both the years of study.

2.2 Effect of Weed Management Practices

2.2.1 Pre-harvest studies

- Different weed management practices did not cause significant variation in initial plant population per unit area during both the years of study.
- Significantly the highest plant height was measured by weedy check which differs significantly from rest of the weed control measures at all growth stages except 30th day stage. Pre-emergence pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS recorded with minimum plant height during both the years.
- Number of branches plant⁻¹ was not influenced appreciably at 30th day stage, while at 60th, 90th day and harvest stage of crop, weed free crop registered the maximum number of branches plant⁻¹ which was comparable with pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS, pendimethalin alone and HW at 25 & 45 DAS during first year and with pendimethalin @ 1.0 kg

a.i. ha⁻¹ + HW at 45 DAS only during second year at 60th dry of crop growth.

- Significantly the highest of nodules was counted by weed free treatment which did not significantly from HW 25 & 45 DAS and pre-emergent pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS during both the years 30th day and harvest stage, during second year at both 60th and 90th day stage and which only HW at 25 & 45 DAS during first year at both 60th and 90th day stages of crop growth.
- Chlorophyll content was the maximum in levels of crop grown under weed free situation which was statistically equal to HW at 25 & 45 DAS during first year at 30th day stage and during both the years at 60th day stage and was significantly higher than rest of the weed management practices during both the years.
- Significantly the highest crop dry weight was associated with weed free treatment as compared with rest of the treatments, but was at par with pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS during second year at both 60th day and harvest stages of crop growth.
- The plant per unit area counted at harvest did not differ significantly due to different weed management practices in both the years of study.
- Differences in days taken to 50% flowering and 50% maturity recorded under the effect of different weed management practices was not perceptible during both the year of experimentation.

2.2.2 Post-harvest studies

- Weed free treatment was the best to record significantly more number of pods plant⁻¹ than the remaining weed management practices in both the years of study, but was comparable with pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS during first year.
- Weed free treatment being similar to integration of pendimethalin @ 1.0 kg a.i. ha⁻¹ and hand weeding at 45 DAS recorded significantly more number of grain pod⁻¹ than rest of the weed management practices during both the years of study.
- Significantly the maximum grain weight plant⁻¹ was associated with weed free as compared with the remaining weed management practices during both the years of study.
- Weed free treatment having not much differences from integrated weed management hand weeding at 25 and 45 DAS and pendimethalin @ 1.0 kg a.i. ha⁻¹ alone registered significantly the highest weight during both the years of study.
- Significantly the highest grain yield was recorded by weed free treatment. Next to weed free treatment integrated weed management (Pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS) was found the best one to record the highest grain yield during both the years of study.
- Straw yield was the highest with weed free treatment which was closely followed by pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS, HW at 25 & 45 DAS and pendimethalin 1.0 kg a.i. ha⁻¹ alone during both the years of study.
- The maximum values for harvest index was recorded by weed free treatment followed by pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS and HW at 25 & 45 DAS during both the years of study.
- Protein content in grain was the maximum when crop raised under weed free situation throughout entire season

followed by integrated method of weed control and hand weeding at 25 and 45 DAS during both the years of study.

- Nitrogen and phosphorus uptake was the maximum when crop raised under weed free situation throughout entire season followed by integrated method of weed control and hand weeding at 25 and 45 DAS during both the years of study.

2.3 Effect of W x P

The crop when grown under weed free condition for entire season and fed with @ 90 kg P₂O₅ ha⁻¹ Provided significantly the highest grain weight plant⁻¹ in comparison with rest of the combinations of both the factors during both the years of study.

3 Studies on Weeds

3.1 Weed flora

There were 7 weed species found in the experimental field. Out of which *C. album*, *A. arvensis*, *M. indica* and *V. hirsute* were of broad leaf group, *C. rotundus* of sedges group and *P. minor* and *C. dactylon* of grassy group.

3.2 Effect of Phosphorus

- Weed density per unit area recorded at different stages of crop growth (30th, 60th, 90th day and harvest stage) decreased with increasing doses of phosphorus from 0 to 90 kg ha⁻¹.
- Application of 90 kg P₂O₅⁻¹ registered significantly the highest weed dry weight per unit area as compared with its lower doses during both the years of study.

3.3 Effect of Weed Management Practices

- By and large, all the weed management practices were found promising to reduce the weed density per unit area over weedy treatment. Integrated method the weed control (Pre-emergence pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS) was found most effective to control the weeds at almost all the stages of crop growth during both the years of study.
- Pre-emergence application of pendimethalin @ 1.0 kg a.i. ha⁻¹ coupled with one hand weeding at 45 DAS (Interacted method) registered significantly the lowest weed dry weight per unit area as compared with rest of the weed management practices.
- Integration of pre-emergent pendimethalin @ 1.0 kg a.i. ha⁻¹ and HW at 45 DAS registered the highest weed control efficiency followed by HW at 25 and 45 DAS.

3.4 Effect of W x P

- At 30 day stage, application of pendimethalin @ 1.0 kg a.i. ha⁻¹ as pre-emergence supplemented with one hand weeding at 45 DAS in conjunction with 0 to 90 kg P₂O₅ ha⁻¹ being comparable with pendimethalin @ 1.0 kg a.i. ha⁻¹ in combination with 30 to 90 kg P₂O₅ ha⁻¹ registered significantly the lowest weed density during both the years of study. At 60th day stage, the combine of integrated weed management and 90 P₂O₅ ha⁻¹ was found the best but was comparable with the combines if integrated methods and 30-60 kg P₂O₅ ha⁻¹ and HW at 25 & 45 DAS in conjunction with either 60 or 90 kg P₂O₅ ha⁻¹ during first year and with the combine of integrated method in presence of 60 kg P₂O₅ ha⁻¹ during second year in respect of reducing weed density per unit area. At 90th day stage, the combination of pendimethalin @ 1.0 kg a.i.

ha⁻¹ + HW at 45 DAS and 90 kg P₂O₅ ha⁻¹ was found most effective to discourage the weed density per unit area during both the years of study, but was comparable with the combination of HW at 25 & 45 DAS and 90 kg P₂O₅ ha⁻¹ during first year. At harvest, the combine of integrated method and 90 kg P₂O₅ ha⁻¹ proved its superiority over rest of the combines of both the factors to reduce weed density per unit area in both the years of study.

- Significantly the lowest weed dry weight was noted under the effect of pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS in conjunction with 0 phosphorus as compared with rest of the treatment combinations during both the years of study.

4. Conclusion

On the basis of results obtained in the present study conducted for the two consecutive years, the following conclusions are being made out which could be useful for both scientists and farmers.

- The next best treatment to weed free was the integrated method of weed management i.e. pre-emergence application of pendimethalin @ 1.0 kg a.i. ha⁻¹ + HW at 45 DAS in respect of providing better yield and yield contributing characters and for effective control of weed. Application of 90 kg P₂O₅ ha⁻¹ was found the best dose to enhance the yield of chickpea and to reduce the weed density per unit area.
- By the large, integrated method of weed control in conjunction with 90 kg P₂O₅ ha⁻¹ was found promising to reduce weed density but was favourable to enhance the weed dry weight per unit area. The interaction effect of both the factors was visible on crop in respect of grain weight plant⁻¹ only when integrated weed management in presence of 90 kg P₂O₅ ha⁻¹ was found favourable to enhance the grain weight plant⁻¹.

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