SEED YIELD AND ECONOMICS OF CHICKPEA (Cicer arietinum) AS INFLUENCED BY FOLIAR APPLICATION OF AGROCHEMICALS

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ABSTRACT
A field study on 76 farmer’s field was conducted in three different villages of Jhunjhunu district of Rajasthan under Rashtriya Krishi Vikas Yojana (RKVY) project during rabi season 2009-10 with the objective to enhance the productivity level and net return of chickpea crop. Data reveals that two foliage application of mixed solution of thiourea (0.05%) and zinc sulphate (0.2%) agrochemicals at branching and pod formation stage has positive influence on chickpea seed yield and net returns. Highest seed yield (10.35 q/ha) achieved under T4 treatment followed by T3 treatment (10.25 q/ha) in comparison to other treatments. The B: C ratio was also highest under T4 treatment (1.42) as compared to control (1.34) and other treatments.

Key words: Chickpea, Foliage application, Agrochemicals, Thiourea, Zinc sulphate.

INTRODUCTION
Chickpea commonly known as gram is an important rabi pulse crop of India. India is the largest pulse producing country and the total production of pulses in India was 13.1 million tons against the requirement of 20 million tons (Gupta et al., 2004) indicating the shortfall which is to be minimized either by increasing the area under pulses or by increasing the productivity per unit area. The pulse production targeted to be 32 million tons with the productivity of 850 kg/ha for the period of 2007-12 by Govt. of India (Yadav and Kumar, 2007). Till date the productivity level of pulses is not sufficient on account of several biotic and abiotic stresses besides unavailability of quality seeds of improved varieties in time and poor crop management practices due to unawareness and non-adoption of recommended production and plant protection technologies. Therefore, it is very essential to popularize the high yielding varieties, resistant to biotic and abiotic stresses and other production technologies which the farmers generally do not adopt.

A wide gap exists between the techniques available and its timely adoption by the farmers which is reflected through poor yield in the farmer’s fields. There is a tremendous opportunity for increasing the production and productivity of chickpea crop by adopting the improved technologies and its management. There are so many appropriate technologies generated by the SAUs, ICAR research institutes but the productivity of chickpea is still very low due to poor transfer of technology from the point of its view of development to the points of its utilization and only a little new knowledge percolates to the farmers fields hence a vast gap has been observed between knowledge production and knowledge utilization. To achieve targeted additional production of pulses, it is necessary to concentrate efforts on scientific and systematic cultivation of chickpea, the most important pulse crop of India.

The productivity level of chickpea crop in the Jhunjhunu district of Rajasthan is also low-slung in comparison to potential yield of the crop, as farmers do not completely follow the general recommended dose of fertilizers especially secondary plant nutrients, micro nutrients as well as because of biotic and abiotic stresses. Especially abiotic stress in chickpea crop in the area is more common which involves slight to moderate soil salinity and prevalence of higher temperature at reproductive and maturity stage are amongst the major factors affecting crop productivity. Salinity of soils in the district is

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increasing day by day because of poor quality ground water, thus results into accumulation of salts in the root zone, whereas, high temperature damages field crops and limit their growth and yield by acting as a dehydrative force. Thiourea (-SH compounds) is not only the fertilizer but is an important plant growth bio-regulator with Sulphydryl group chemical having 36 per cent nitrogen and 42 per cent sulphur which helps in photo synthesis, synthesis of chlorophyll (Garg et al. 2006), transportation of food, assimilate partitioning, altered pattern of protein synthesis, changes in the activities of antioxidants and so many other bio-chemical activities in the plant. It is highly water soluble and easily absorbed in the living tissues. The plant stress tolerance can be improved up to a certain extent with the exogenous application of stress alleviating chemicals. Among stress alleviating compounds, thiourea is an important molecule with two functional groups, “thiol” is important to oxidative stress response and “imino” partly fulfil the N requirement (Farooq et al., 2009). Under high temperature conditions, external use of thiourea can increase K⁺ uptake and reduce ABA biosynthesis (Aldasoro et al., 1981). Sahu and Singh (1995) reported that foliar spray of thiourea significantly increased growth and yield most probably via improvement of the photosynthetic efficiency and canopy photosynthesis. Likewise, zinc is one of the most important plant micro nutrients which helps in synthesis of amino-acids, essential plant hormones, transportation of carbohydrates, regulates oxidation-reduction and photo synthesis activities in the plants. Keeping the importance of thiourea and zinc sulphate in chickpea crop, the KVK, Jhunjhunu conducted this study under RKVY project on 76 farmer’s field during rabi, 2009-10 with the following objectives:

1. To assess the efficacy of foliar application of thiourea and zinc sulphate agrochemicals on productivity of chickpea and
2. To calculate and compare the economics of different treatments in semi-arid irrigated conditions of Rajasthan.

**MATERIALS AND METHODS**

To convince the farmers for adoption of foliar spray of agrochemicals like thio-urea and zinc sulphate in chickpea crop to enhance the productivity, three villages of the Jhunjhunu district of Rajasthan namely Bugala, Kayamsar and Varispara were selected under RKVY project during rabi season 2009-10. Total 76 farmers growing chickpea were selected in above three selected villages through PRA technique for two foliar spray of thio-urea and zinc sulphate agrochemicals in standing chickpea crop at branching and pod formation stage to enhance the productivity. Four treatments viz; T₁ - control (no spray), T₂ - 2 spray of 0.05 % thio-urea at branching and pod formation stage, T₃ - 2 spray of 0.5% zinc sulphate at branching and pod formation stage, and T₄ - 2 spray of 0.05 % thio-urea + 0.2% zinc sulphate (mixed solution) at branching and pod formation stage by tractor mounted power sprayer using 500 litre of water/ha were tested. The crop was sown in the second fortnight of October under irrigated conditions along with recommended doses of nutrients N, P and K. The crop was harvested in last week of March. Selected farmers fields were regularly monitored by KVK scientist from sowing to harvesting. The biological yield of experimental fields were recorded on individual farmer basis and analysed for net return and B:C ratio calculation. For calculating gross return, net return and B:C ratio, MSP declared by Govt. of India for rabi season 2009-10 produce (Rs 1730/qtl) was used.

**RESULTS AND DISCUSSION**

Results reveal that average grain yield under T₁, T₂, T₃ and T₄ treatments were 8.0, 9.25, 10.25 and 10.35 qtl/ha (Table 1). This increase in grain yield was 15.63, 28.13 and 29.38 per cent higher in respective treatments over control. This increase in grain yield might be due to improvement in photosynthetic efficiency and finally synthesis of chlorophyll as well as because of its positive impact on translocation of photosynthates from source to sink by foliar application of thiourea and sufficient availability of zinc micronutrient under this treatment which might play an important role in synthesis of various enzymes, N metabolism and several oxidation-reduction reactions that improves efficiency of chloroplasts to capture solar energy through enzymic carbonic anhydrase. Hazra and Som (1999) also reported that zinc sulphate required for the activity of various enzymes including dehydrogenase, aldolase, isomerases, transphosphorylases and RNA and DNA
polymerases, thereby, zinc deficiency is associated
with an impairment of carbohydrate metabolism and
protein synthesis. Per hectare basis highest gross
income Rs. 18,216/- was achieved under T4
treatment which was Rs. 4,136/-, Rs.1,936/- and
Rs. 176/- higher than T1, T2 and T3 treatments,
respectively. The net return (Rs./ha.) was Rs. 3,585/
-, Rs. 4,295/-, Rs. 4,680/- and Rs. 5,431/- under
T1, T2, T3 and T4 treatments, respectively (Table 1 &
Fig. 2). This might be due to higher grain yield
achieved under T4 treatment as compared to other
treatments. The B:C ratio was also highest (1.42)
under T4 treatment as compared to control (1.34).
Low B:C ratio (1.35) under T3 treatment was
because of higher cost of cultivation under this
treatment (Rs. 13,360/ ha.) than other treatments
due to comparatively higher requirement of zinc
sulphate under this treatment. Similar results were
also observed in horse gram (Anitha et al, 2006).

*Sale price(MSP) was Rs. 1730/qt! for rabi produce 2009-10.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Grain Yield (q/ha)</th>
<th>% increase over control</th>
<th>Gross Income (Rs/ha)</th>
<th>Cost of cultivation (Rs/ha)</th>
<th>Net Return (Rs/ha)</th>
<th>B:C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 - Control (no spray)</td>
<td>8.00</td>
<td>-</td>
<td>14080</td>
<td>10495</td>
<td>3585</td>
<td>1.34</td>
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<tr>
<td>T2 - Thio urea @ 0.05%</td>
<td>9.25</td>
<td>15.63</td>
<td>16280</td>
<td>11985</td>
<td>4295</td>
<td>1.36</td>
</tr>
<tr>
<td>T3 - Zinc sulphate @ 0.5 %</td>
<td>10.25</td>
<td>28.13</td>
<td>18040</td>
<td>13360</td>
<td>4680</td>
<td>1.35</td>
</tr>
<tr>
<td>T4 - Thio urea @ 0.05% + Zinc sulphate @ 0.2 %</td>
<td>10.35</td>
<td>29.38</td>
<td>18216</td>
<td>12785</td>
<td>5431</td>
<td>1.42</td>
</tr>
</tbody>
</table>

**TABLE 1.** Effect of foliar applied agrochemicals on yield and economics of chickpea crop

**FIG 1:** Effect of foliar spray of agrochemicals on seed yield & B:C ratio of chickpea crop
**CONCLUSION**

It can be inferred from the present investigation that chickpea crop should be sprayed twice with agrochemicals like thiourea @ 0.05% + zinc sulphate @ 0.2% (Mixed Solution) with recommended dose of nutrients for higher seed yield and better net returns.

**REFERENCES**


