



Current Status of Agronomic Practices Adopted in The Production of Chickpea: A Study of Rajasthan, India

Nitin Goyal¹, Amita Girdhar², S.K.Goyal³, Garima⁴

Dept. of Business Management, CCS Haryana Agricultural University, Hisar, 125004

Email: nitin.goyal2411@gmail.com

ABSTRACT

*Chickpea being the highly nutritious crop forms an important part of the human diet. . In general, it has more protein content than that of most of the other legumes. Seeds are rich in mineral content that includes phosphorus, calcium, magnesium, iron and zinc. It is best source for purifying the blood as well as assists in lowering of cholesterol in bloodstream. Chickpea is considered as a good rational crop because it has the nitrogen fixation ability which ultimately leads to the agricultural sustainability. Its presence improves soil health by promoting microbial population and activity. Although it is known that chickpea fixes nitrogen from atmosphere, there is strong evidence that if additional dose of nitrogen is added it leads to increased seed yield, seed protein and amino acids. However, its requirement for nitrogen fertilizer is lower than other crops to obtain higher yield and improved quality of seed. This paper attempts to study the various agronomic practices that are currently adopted by the farmers in the production of the chickpea. The research was conducted in the four villages of Hanumangarh district of Rajasthan. And it was observed that Main varieties grown include Ghanghor (GNG-469), Samrat (PDM-84-136), HC-1, Vardhan etc. However, Ghanghor and Samrat were the major varieties grown in the sampling unit. Samrat is a bold seeded variety whereas Ghanghor is regular size one. Chickpea is a legume crop and does not require a high dose of nitrogenous fertilizer. Most of the demand for fertilizer is met through DAP (Di-ammonium Phosphate). Some farmers are also using SSP (single super phosphate) in addition to DAP. Irrigational need of the crop is mostly taken care with canal water, but some farmers have tube wells for irrigation in case of water shortage for the purpose of weed management, manual method like hand hoeing is practiced. In some cases, pre-emergence spray of herbicide is also done to control weeds. Major weed flora includes *Chenopodium album* (Bathua) and *Gajar Ghaas*. Major insect having considerable economic damage to the crop is pod borer (*Helicoverpa armigera*) and termites. For the control of pod borer farmers adopt chemical method of control i.e. insecticide spray.*

Keywords: chickpea, agronomy, legume.

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INTRODUCTION

Chickpea (*Cicer arietinum*) is one of the most important legumes. Being highly nutritious like protein (18-20%), complex carbohydrates (52-70%), fiber (6%), fats (4-10%), vitamins etc. make this crop an important part of our daily diet. In general, its protein quality is better than that of most of the legumes. Seeds are rich in mineral content that includes phosphorus, calcium, magnesium, iron and zinc. Its leaves contain malic acid and citric acid, both of which are useful in stomach ailments. It is best source for purifying the blood as well as assists in lowering of cholesterol in bloodstream. It is mostly consumed in the form of processed whole seed or dal or as dal flour (Besan). It is also used as an excellent fodder. It can easily be grown on the soil with lesser moisture. That's it is grown mainly in the Rajasthan state of India. It can grow well in two or three irrigations but better results are there with rainfall because condition of groundwater is quite poor and not suitable for the production [1-3].

Climatic distribution

Several researchers have reported that chickpea can grow under various environmental stress conditions like drought, high temperatures and poor soil conditions. But in certain conditions like drought stress, plant growth and yield is reduced by reduction in surface area of leaf and rate of photosynthesis. In addition, water stress at early stages reduces total biomass and seed yield of chickpea, while excess or deficit of moisture causes significant reduction of yield of the crop. This crop can play an important role in the traditional semi-arid areas of Mediterranean basin taking into consideration the partial drought

tolerance along with its increasing grain legume value in sustainable agricultural systems. Furthermore, chickpea can be grown as an important food security crop in the semi-arid and dry environments of northern Greece and it can also be helpful as an important winter rotational crop in this region [5, 6].

Agronomic practices in Chickpea

The ideal time of sowing in rainfed areas is mid-October whereas under irrigated condition, mid-November is the optimum time. To utilize soil moisture of *kharif* season sowing in central and southern zone is generally 10-15 days earlier than north India. While the optimum time of sowing Kabuli chickpea is October end-beginning of November.

The small seeded varieties require lesser seed in comparison to bold seeded varieties due to low test weight. For timely planting of *desi* type, 40-45 kg/ha is sufficient. In case of Kabuli chickpea 80-100 kg/ha is optimum. Under late planting conditions, seed rate increase by 20-30%. Seed treatment with *Rhizobium inoculum* is beneficial for crop [8].

Chickpea responds admirably to liberal doses of phosphate application. A starter dose of 20 kg N/ha helps quick establishment of the crop and root nodule development. Application of 40 kg P₂O₅, 20 kg of K₂O and 20 kg S/ha greatly increases yield of these pulses and benefit the succeeding crop.

Crops sown in pre-rabi season are mostly grown on residual soil moisture without irrigation. However, in pre-summer season these crops require irrigation. Irrigating the crop at least twice at flowering and pod development stage as these are the most critical stages for irrigation [10].

Chickpea production in Rajasthan at a glance

From the point of area sown under chickpea, Rajasthan stands at 4th place with 942,000 Ha of area in 2015-16 which is 11% of total area sown under chickpea in India. Madhya Pradesh tops the list followed by Maharashtra and Karnataka.

If we consider the production of chickpea at national level, Rajasthan stands at 2nd place only after Madhya Pradesh. Rajasthan accounts for 12% of total chickpea production with Madhya Pradesh accounting for nearly half of India's total production.

Most of the soil of the Rajasthan region has low content of organic matter and nitrogen supply is poor. It makes it important to use the bio fertilizers to make fertilizer use efficiency. It increases the amount of microbiologically fixed nitrogen for the plant growth. By keeping in view the above factors and importance of this crop the study has been taken to identify the current status various agronomic practices associated with the production of chickpea.

MATERIAL AND METHODS

The process of selecting number of units for a study in such a way that the units represent the large group from which they are selected is called sampling. For this research the sampling unit referred is, farmers growing chickpea in four villages of Hanumangarh district of Rajasthan namely:

- Sangra,
- Ajeetpura
- Chhoti Chhani
- Suratpura

The sample size used were 80 farmers from the selected population. For this research convenience sampling is used. The selection of the villages was made on the random basis. The main reason behind the study was to find the various practices that a farmer is using in the production of chickpea.

Frequency distribution method was used for the analysis of the data collected.

Data Analysis and Interpretation

Analysis was made after surveying the four villages in the Rajasthan district. Various observations and their interpretations are as follows:

1. LITERACY LEVEL:

Category	No. of respondents
Illiterate	29
Upto Matric	41
Above Matric	10

Interpretation: This data clearly indicates that 60% of the farmers are literate and that too with 13% more than metric. And it ultimately reflects a good condition of farming as there is more possibility to accept the change.

2. Land Size:

The table given below shows the total size of the land holdings with the farmers.

Category	No. of respondents
up to 10 beegha	25
10-20 beegha	25
more than 20 beegha	28

Interpretation: In this region land size is calculated in beeghas which is equal to 5 canals. Varied land size represents the status of the farmers but not always because few farmers may also get better produce instead of having larger acreage.

3. Land size under Bengal Gram:

The table and chart given below is depicting the land size of farmers under chickpea.

Category	No. of respondents
up to 10 beegha	52
10-20 beegha	15
more than 20 beegha	13

Interpretation: A very large population nearly the 50% grows chickpea in lesser than 10 beegha as the farmers grow another crop like wheat and mustard as well.

4. No. of field operations:

The table and chart below shows the total no. of field operations done by the farmer including sowing.

Category	No. of respondents
3	4
4	24
5	35
6	11
7	4

Interpretation: Many farmers don't have their own tractors or implements so they cultivate their land on hire basis so most of these go for 4 or 5 field operations which is the least requirement. And the 6 or 7 field operations mainly adopted by those who have their own implements. These figures of field operations also involve the sowing process.

5. Seed Rate:

The chart below shows the quantity of seed rate used in the sowing of chickpea.

Category	No. of respondents
8-10kg	16
10-12kg	31
more than 12 kg	33

Interpretation: Here the 41% of farmers use the seed more than 12 kg. Although there is not much difference in the other categories, but it depends on the choice of the farmers. The farmers who have used the variety samrat for the sowing, they have used a somewhat large quantity of seed as it is a bold seeded variety although belongs to Des chickpea but bold than the other varieties being used. But only variety it also depends on the various clusters in the villages. A certain group of people had used the same quantity of seed.

6. Sowing Date:

The following chart and table represents the date of sowing of chickpea adopted by various farmers.

Category	No. of respondents
2nd fortnight of October	31
1st fortnight of Nov.	27
2nd fortnight of Nov.	15
December	7

Interpretation: It indicates that most of the farmers have completed their sowing with in Oct. or Nov. month and those who belong to 9% category most of them have sown Samrat variety which is a bold seeded and late sown variety. Here also not only the varieties, farmers have also done the sowing on the basis of the water availability. Because for the better germination, farmer prefer canal water over tubewell as there was no rain at that time, so it also brings the variation.

7. **Fertilizer Details:** The table and chart below the various fertilizer doses used by the farmers for chickpea production.

Category	No. of respondents
10-15kg DAP	31
more than 15 kg DAP	40
DAP+SSP	7
FYM	2

Interpretation: Here is a variation among the usage of Fertilizer. A large no. of farmers prefer only DAP as a fertilizer. But there is a variation in the usage of dose. 9% farmers also use both DAP and SSP. And only 2% go for the FYM. Since the major nutrient required is phosphorus and small quantity of nitrogen as it is a leguminous crop (can fix the atmospheric nitrogen) so farmer find it beneficial to use DAP but those who are using SSP+DAP, the major quantity used by them is of SSP as it is providing the major nutrient required by the crop.

8. **Weed control:** The chart and table given below is showing the method of control of weeds used by farmer in chickpea.

Category	No. of respondents
manual+chemical	53
only manual	27

Interpretation: This graph indicates that instead of using herbicide by 66% population all the farmers do the manual weeding. Herbicide used by the farmers is pendimethalin. According to the farmers it controls only *Chenopodium album* and that too in very small quantity and there is no effect on the rest of the weeds, so they have to do manual weeding. In this region weeds is biggest issue among farmers. They say that no chemical is effective against the control of the weeds. And many companies have their products to control insect but these uncontrollable weeds leads to a huge loss in yield. It also brings the huge opportunity for the pesticide industry.

9. **Source of Irrigation:** The table and chart given below reveals the method of irrigation followed by farmers in chickpea

Category	No. of respondents
Canal	57
tube well	6
Both	17

Interpretation: It indicates that most of the farmers irrigate their field through canal water. The reason behind this is, 1) they don't have installed tube well in their fields and if use tube well of another farmer's field he charges higher prices and 2) is they don't find the quality of water good for Bengal Gram production.

Although a major issue was observed while the farmers were irrigating their lands through canal water. It was seen that water supply in the canals is less. And the govt. has fixed the timings for the farmers to irrigate their land but if it is about one beegha or two then the time is sufficient to irrigate their land but the farmers who have more acreage of the land, don't find this time sufficient to irrigate their whole land. So it becomes their necessity to install the tubewell in their fields and irrigate their fields with poor quality water.

10. **Insecticide details:**

Category	No. of respondents
Missile	18
Kingdoxa	27
Awant	11
Acephate	11
Daman	2
Fortuner	11
Coragen	2

Interpretation: A variety of the insecticides are used by famers in controlling pod borer. Most of them have chemical *Emamactin benzoate*. Now it depends on the preference of the farmers or availability with the dealer and in this region major share is covered by kingdoxa and missile and it also depends on the effectiveness of the previous chemical being used. In terms of using insecticide it was observed that people belonging to a cluster use the same product.

RESULTS AND DISCUSSION

The study indicates that most of the farmers which were reviewed for the study were literate. Even 13% of the total farmers reviewed were graduates. On the basis of acreage of land, the farmers were studied

and it was found that each category had the equal no. of farmers. In that region land is calculated in terms of beegha which is equal to five canals. And if we land talk about land under chickpea then it can clearly be depicted that most of the farmers take other crops as well as the land under chickpea is lesser than 10 beegha for most of the farmers. In terms of the seed rate, most of the farmers are using more than 10kg seed for sowing. The reason behind this was that most of the farmers out of these were using Samrat variety which is a bold seeded variety and hence required in more quantity.

Regarding the impact of various agronomic factors on the yield of the chickpea M.C. Saxena did a study in 1980 on the chickpea in west Bengal. He found that the crops that had the highest yields were sown in first week of Nov. but in this research the results were somewhat different. Major share of farmers sow their crop in the 2nd fortnight of October [9].

A.N. Rao and others did a study in 2010 on the Integrated Weed Management on various field crops and they found out that herbicides use in combination with hand weeding was most economical. And the research supports this fact because major share of the farmer is doing manual weeding in combination to the chemical sprays [7].

K.G. Mandal and others (2002) calculated the dose for the various fertilizers in the production of different legumes that included chickpea as one of the crop. If results are compared from the previous research then it can be concluded that there is not much difference in the usage of phosphorous fertilizer but in case of nitrogenous fertilizer the change is that these days, no dose of nitrogenous fertilizer is used in the production of chickpea [4].

The study concluded that only three field operation were done till sowing(including) but these days, most of the farmers go for five field operation and some go for even six and seven.

The study also reveals that earlier there used to be sufficient moisture in the soil so there was no necessity to further irrigate the land to grow chickpea and the crop used to grow with retained soil moisture but presently, due to high temperature there is not sufficient moisture in the upper layers of the soil so they require one or two irrigations

CONCLUSION

Chickpea (*Cicer arietinum* L.) is one of the most important grain legumes in the world. It is grown all over the world for its high nutritional value as well as a booster of soil nitrogen. It has two variants i.e. desi chickpea as well as Kabuli chickpea which differ from each other in terms of their colour and Testa of seed. However, Kabuli chickpea is considered more advanced primarily because of its reduced pigmentation and higher nutritional value. Chickpea is mainly grown on sandy loam soil with limited water retention capacity as it requires good aeration in its root zone to germinate and grow well. The soils in western Haryana and all of Rajasthan are a good harbor to this crop. Intercropping this crop with other crops is also a viable option but majority of area lies with chickpea grown as a single crop.

Main varieties grown include Ghanghor (GNG-469), Samrat (PDM-84-136), HC-1, Vardhan etc. However, Ghanghor and Samrat were the major varieties grown in the sampling unit. Samrat is a bold seeded variety whereas Ghanghor is regular size one. Chickpea is a legume crop and does not require a high dose of nitrogenous fertilizer. Most of the demand for fertilizer is met through DAP (Di-ammonium Phosphate). Some farmers are also using SSP (single super phosphate) in addition to DAP. Irrigational need of the crop is mostly taken care with canal water, but some farmers have tube wells for irrigation in case of water shortage. For the purpose of weed management, manual method like hand hoeing is practiced. In some cases, pre-emergence spray of herbicide is also done to control weeds. Major weed flora includes *Chenopodium album* (Bathua) and Gajar Ghaas. Major insect having considerable economic damage to the crop is pod borer (*Helicoverpa armigera*) and termites. For the control of pod bored farmers adopt chemical method of control i.e. insecticide spray. Harvesting is done manually with sickles and then thresher is used to obtain grain from the pod. Most of the farmers sell the produce to local village merchant however some sell the crop in fresh green form to nearby retailers.

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