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Analysis of Chickpea Pests and their Management Adopted by the Farmers in Tehsil Kallurkot

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Abstract:
Chickpea is considered the third most important pulse in the world. It is widely grown in many subtropical and warm-temperate regions. It is the common name for an annual plant, Cicer arietinum, of the Fabaceae family that is widely cultivated for its typically yellow-brown, pea like seeds. Chickpea is the major summer pulse of Pakistan. About 88% area under pulses is in the Punjab province which produces 85% of total production in the country. The purpose of the study is to measure major challenges in chickpea pest management and adaptation by the farmers in tehsil kallurkot. The study area consisted of 10 union councils of tehsil kallurkot and 2 union councils were selected randomly from each selected UC, 2 villages were selected randomly. There were 30 respondents selected from each village a sample size of 120 respondents were selected through a simple random sample technique. A random sampling technique was used for the collection of data. An interview schedule was used for both qualitative and quantitative data collection. The collected quantitative data will be analyzed by using Statistical Package for Social Sciences (SPSS). Results indicated that farmers had a high threat from termites and grasshoppers, but the farmers had low awareness about insect and their control, the adoption level of pesticides against pest control is also very low.

***Keywords**: Chickpea, Production, constraints, Awareness, Adoption, Pests*

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1. Introduction

Chickpea (Cicer arietinum L.) is an annual self-pollinated, diploid pulse (Millan *et al.,* 2006). The height of chickpea plant is generally 0.2-1m with excessive nodules on roots. The life cycle of chickpea crop is three to six months and usually gets mature after one month of flowering. Chickpea is highly nutritious having protein (20-30%), carbohydrates (40%) and less amount of oil which is only 6% (Gil *et al*., 1996).

Chickpeas are a vital source of protein for developing nations and thus are mostly used for human consumption. Seeds of chickpeas are used in different ways either eaten as a whole, as flour, or the young plants consumed as vegetables. In some parts of the world, chickpea is also cultivated for livestock feed. Based on diversity, chickpeas are divided into two groups i.e. Kabuli and Desi. Kabuli is large in size, creamy in color and ram-head in shape, while desi is angular, smaller sized and dark in color. Chickpea is the third most vital crop (legume) in the world after peas (*Pisum sativum* L.) and dry beans (*Phaseolus vulgaris* L.) (Pande *et al.,* 2005). Chickpea is cultivated worldwide on 13.5 million hectares with production of 13.1 million tonnes. Pakistan ranks third in the world in chickpea production (FAO, 2013).

Chickpea is the largest Rabi crop in Pakistan, mostly cultivated in Barani areas on an area of 873 thousand hectares with a yield of 261 thousand tonnes. During 2020-2021, Gram production declined by 47.6 percent to 266 thousand tonnes on account of a decline in area, yield and unfavorable weather conditions (GOP, 2021). Chickpeas are grown in semi-arid and sub-tropical zones of Pakistan (Iqtidar and Amanullah, 2002). Major chickpea cultivation i.e. 90% is under rainfed areas of Punjab Province, and the districts where this crop is cultivated include; Mianwali, Khushab, Bhakkar, Chakwal, Faisalabad, Jhang and Layyah (Khan *et al.,* 1999). The environment of these districts is highly favorable for chickpea crops, but the optimum yield is not being obtained in these areas due to a fungal disease i.e. chickpea blight (Ali *et al.,* 2011).

About ninety percent of losses in the yield occur due to the occurrence of foliar and root based diseases and pathogenic fungi (Zamani *et al.,* 2004, Sharma and Muehlbauer, 2007). Chickpea production is greatly influenced by foliar and root based pathogens in many countries of the world like India, Pakistan, Tunisia, Spain, Iran, Nepal and Burma. Root infecting pathogenic fungi involves mainly *Fusarium oxysporum* f.sp. *ciceris, Macrophomina phaseolina*, *Fusarium solani*, *Rhizoctonia solani* and *Phythium ultimum*. The pathogens can be in active phase even in the absence of its host for more than six years even they are seed or soil borne (Ayyub *et al.,* 2003). It was published that *Fusarium* wilt (*Fusarium oxysporum*) damaged 10-15% yield losses in chickpea while black root rot (*M. phaseolina*) damaged 60-70% yield. Dry root rot caused by *Macrophomina phaseolina* damage over 500 host plant species of the tropical and temperate regions of the world (Inam-ul-Haq *et al.,* 2015).

Production of chickpea is solely dependent on the concentration of rain falls. In the region of Thal in Pakistan, this crop is produced in bulk quantity. With time, the agricultural produce of chickpeas declined. As we all know that regions of Thal are dry, they have low soil productivity; Like other crops, chickpea is also is exposed to the dangers of various epidemics such as pests, diseases, lodging by winds and grain shriveling due to a sudden rise in temperature at grain maturity stage (Andrieu *et al.,* 2015). An experienced farmer can easily anticipate the extent of loss in output caused by these problems. According to farmers' perceptions attack of aphids/jassids, wind blow and different pathogenic diseases were the main causes of yield decline in the area. Low temperature, water

shortage, and disease attack contributed to yield decline. According to farmers, the pesticides companies were suggesting pesticides for aphids/jassids control, whereas, the extension department was against the spray at this stage (Akhtar *et al.,* 2015).

Yield gaps are also classified according to constraints like agronomic gaps which are mainly due to physical and biological constraints, and poor disease management. Socioeconomic gaps are mainly due to socioeconomic constraints, institutional gaps which are due to institutional constraints and mixed gaps which are due to the above-mentioned gaps (Maik *et al.,* 2015).

The chickpea productivity remained different among farmers, the efforts are required to evaluate the factors which cause the variation in productivity. Therefore, this study has been designed to fulfill the following objectives to identify the chickpea pests management gaps.

2. Objectives

- To identify the awareness level of chickpea farmers regarding recommended pests' management techniques
- To identify the adoption level of chickpea farmers regarding recommended pests' management techniques

3. Review of Literature

Pakistan is undergoing many structural changes in its economy as it is shifting from the agricultural to the services sector. Despite these changes, the largest sector of Pakistan's economy is still agriculture. Although the share of agriculture in the country's GDP is declining, still it contributes a big share of 20.9 percent in its GDP. Almost 43.5 percent population of Pakistan receives employment from this sector (GOP, 2016) Grains production had been increased worldwide during the last 50 years mainly due to the adoption of modern technologies and soil intensification. Demand for food grain is expected to be increased which may be fulfilled by better management practices and agricultural intensification rather than increase in area under the agriculture (Neumann *et al.,* 2010). The presence of wide yield differential has been demonstrated in several yield gap studies. In Pakistan, there is as much as 40- 50 percent of yield gap in wheat production that is believed to exist (Salam, 2012). There exists a wide productivity gap in different crops. Pakistan is the second-largest country in the world in the area and third largest in the production of chickpea (World Bank, 2011). The annual production of dry seed is seven lacks sixty thousand million tons that are obtained from an area of 1.094 million hectares, this contributes about 4.7 percent in the national economy of the country (GOP, 2016b) Per capita per day availability of chickpea in the world is 3.4 gram while in Pakistan it is 16.23 gram. Pulses are the primary source of vegetable protein. The total cropped area on which they are cultivated is five percent. Demand for pulses is increasing day by day due to an overriding increase in population. There is a dire need to invent new high-yielding varieties of pulses and use of better management practices to respond the increasing demand for pulses. In Pakistan, chickpea, lentil, mung bean, black gram or mash and khesari are the mainly grown pulses (Vijayaprakash and Dandin, 2005).

Punjab province is the major chickpea producing area in Pakistan which is considered the home of chickpea in Pakistan. It contributes 80% to the production of chickpeas (Hassan and Khan, 1991). The cultivation of the chickpea area rose to 943 thousand hectares to 945 thousand hectares, Production of chickpea is 312 thousand tonnes, showing a decrease in production 17.7% from the previous year it

was 379 thousand tonnes. Due to its high contents, the cheap protein it is highly consumed by the poorer section of people. The normal use of Chickpea maintains a good digestion and control cholesterol level in the human body. It is used as medicine for the treatment of snakebite, sunstroke, bronchitis, leprosy, skin diseases, blood disorders and biliousness etc. In the desert areas of Punjab, which includes Thal, chickpea is the main resource for their living and earning for themselves (Andrieu *et al.,* 2015; Nene *et al.,* 1996; Yan *et al.,* 2015).

Cevik *et al.* (2015) explored the genetic relationships among 23 cultivated chick pea and 2 genotypes of *Cicer reticulatum* using simple sequence repeat (SSR) markers. Genotypes of *C. reticulatum* were found to be different from the cultivated chickpea. ICC 4958, "microsperma," or desi chickpea was found to be the closest cultivar to *C. reticulatum* genetically. Aggarwal *et al.,* (2015) studied the genetic diversity in 125 in Indian chickpea cultivars (42 were resistant and 13 were susceptible) to *fusarium* wilt and *Ascochyta* blight using 40 ISSR primers. Genetic diversity revealed more variability among miscellaneous cultivars in comparison to resistant and susceptible cultivars. Genetic variability of cultivars can be increased by exploiting the available diverse germplasm.
Ascochyta blight (AB) is caused by *Ascochyta rabiei* (Pass.) Labrousse and is the major constraint in chickpea production worldwide. The disease has been reported in major chickpea-growing countries (Pande *et al.,* 2005). In 1911, the first blight epidemic occurred in the former Punjab province of British India (Kaiser *et al*., 2000). Rapid spread of infection to aerial parts leads to the death of the plant. Pod infection via testa and cotyledons affects the seed quality. Infected seeds with cankers and pycnidia appear discolored and shriveled (Pande *et al*., 2005).

Fusarium wilt caused by fungus, *Fusarium oxysporum* f. sp. *ciceris* (FOC), is another important disease of chickpea more prevalent in lower latitudes (0-30°N) having relatively dryer and warmer environment. The disease was first reported from India (Singh, 2003). *Fusarium* wilt incidence varied from 14 to 32% in different states of India as reported by Dubey *et al.,* (2010).
Macrophomina phaseolina (*Rhizoctonia bataticola*) causes dry root rot in chickpea. It is a serious problem and has been reported from Australia, Ethiopia, Iran, Pakistan, Bangladesh, Nepal, and several other countries (Singh and Sharma 2002). Although it is present in all growing regions of India, it is most prevalent in Central and South India, as rainfed conditions are used for growing crops. At flowering and podding stage, environmental conditions like temperature and moisture content of soil affect the severity of the infection. Deep plowing and removal of infected host debris from the soil reduce disease severity. Moisture stress conditions should be avoided. Timely sowing of early maturing varieties is a good option to escape the hot weather conditions during maturity of the disease (Gurha *et al.,* 2007).

4. Methodology

The present study entitled: Analysis of chickpea disease and their management adopted by the farmers in tehsil Kallurkot. There are four tehsils in district Sahiwal (Bhakkar tehsil, Darya khan tehsil, Mankera tehsil and kallur kot). Tehsil Kallur kot has been selected randomly. The study area consisted of 10 union councils of tehsil kallurkot and 2 union councils were selected randomly from each selected UC, 2 villages were selected randomly. There were 30 respondents selected from each village

a sample size of 120 respondents were selected through a simple random sample technique. A List of farmers who had visited or beneficiaries of Chickpea growers will be obtained with the help of the Agricultural Officer (AO) of the respective area to collect data. A well-prepared and well structured interview schedule was designed for data collection. Random sampling technique was used for the collection of data. The interview schedule was used for both qualitative and quantitative data collections. To build frequencies, percentage, means, standard deviation and Rank order. The collected quantitative data were analyzed by using Statistical Package for Social Science (SPSS).

5. Results and Discussion

Table 1: Distribution of the respondents concerning threat and awareness about chickpea insects/pest

Insect/pest	**Threats**				**Awareness**			
	Yes		No		Yes		No	
	f	%		%	*f*	%	*f*	%
Termite (Deemak)	117	86.6	15	11.4	63	47.7	69	52.3
Gross hopper (Toqa)	111	84.1	21	15.9	71	53.8	61	46.2
Cut worm (Chor keera)	109	82.6	23	17.4	69	52.3	63	47.7
Aphid (sust teela)	101	76.5	31	23.5	57	43.2	75	56.8
Army Worm (lashkari Sundi)	110	83.3	22	16.7	72	54.5	60	45.5
Pod borer (Tod ki Sundi)	80	60.6	52	39.4	34	25.8	98	74.2
Total	132	100.0	132	100.0	132	100.0	132	100.0

The threat of pests caused by the attack of Termite (Deemak), Gross hopper (Toqa). Cut worm (Chor keera) Aphid (sust teela), Army Worm (lashkari Sundi), Pod borer (Tod ki Sundi) are so vigorous at the place of Kallur Kot.

Table 1 explains in the area of Kallur Kot, 117 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 86.6) had suffered from the attack of Termite while 15 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 11.4) had not suffered from the attack of Termite. In the area of Kallur Kot, 111 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 84.1) had suffered from the attack of Gross hopper while 21 percent of the answerer of the tested sample (the total percentage of answerer of tested sample in Kallur Kot is 15.9) had not suffered from

the attack of Gross hopper. In the area of Kallur Kot, 109 percent of the answerer of the tested sample (the total percentage of answerers of tested sample in Kallur Kot is 82.6) had suffered from the attack of cut worm while 23 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 17.4) had not suffered from the attack of cut worm. In the area of Kallur Kot, 101 percent of the answerer of tested sample (the total percentage of answerers of the tested sample in Kallur Kot is 77.5) had suffered from the attack of Aphid while 31 percent of the answerer of the tested sample (the total percentage of answerer of tested sample in Kallur Kot is 23.5) had not suffered from the attack of Aphid. In the area of Kallur Kot, 110 percent of the answerer of the tested sample (the total percentage of answerers of tested sample in Kallur Kot is 83.3) had suffered from the attack of Army Worm while 22 percent of the answerer of the tested sample (the total percentage of answerer of tested sample in Kallur Kot is 16.7) had not suffered from the attack of Army Worm. In the area of Kallur Kot, 80 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 60.6) had suffered from the attack of Pod Borer while 52 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 39.4) had not suffered from the attack of Pod Borer.

Termite : In the area of Kallur Kot, 63 percent of the answerer of the tested sample (the total percentage of answerers of tested sample in Kallur Kot is 47.7) had aware from the attack of Termite while 69 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 52.2) had not aware from the attack of Termite .Gross hopper: In the area of Kallur Kot,71 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 53.8) had aware from the attack of Gross hopper while 61 percent of the answerer of the tested sample (the total percentage of answerer of tested sample in Kallur Kot is 46.2) had not aware from the attack of Gross hopper. Cut worm: In the area of Kallur Kot, 69 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 52.3) had aware from the attack of cut worm while 63 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 47.7) had not aware from the attack of cut worm. Aphid: In the area of Kallur Kot, 57 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 43.2) had aware from the attack of Aphid while 75 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 56.8) had not aware from the attack of Aphid. Army Worm: In the area of Kallur Kot, 72 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 54.5) had aware from the attack of Army Worm while 60 percent of the answerer of the tested sample (the total percentage of answerer of tested sample in Kallur Kot is 45.5) had not aware from the attack of Army Worm. Pod Borer: In the area of Kallur Kot, 34 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 25.8) had aware from the attack of Pod Borer while 98 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 74.2) had not aware from the attack of Pod Borer.

Table 2: Distribution of the respondents concerning the adoption of chickpea insects/pest management

Insect/pest	**Recommended chemicals**	**Adoption**			
		Yes		No	
		f	%	*f*	%
Termite (Deemak)	Chloropyrifos 40ec	35	26.5	97	73.5
Gross hopper (Toqa)	Befenthrin 10ec	32	24.2	100	75.8
Cut worm (Chor keera)	Befenthrin 10ec	31	23.5	101	76.5
Aphid (sust teela)	Imidacloprid 200SL	26	19.7	106	80.3
Army Worm (lashkari Sundi)	Emamectin 1.9ec	43	32.6	89	67.4
Pod borer (Tod ki Sundi)	Emamectin 1.9ec	31	23.5	101	76.5
Total		132	100.0	132	100.0

Table 2 explains that in the locality of Kallur Kot the habitant of that targeted area behaves differently according to their expertise about the adoption measures against Termite (Deemak), Gross hopper (Toqa) , Cut worm(Chor keera) , Aphid (sust teela), Army Worm (lashkari Sundi) , Pod borer (Tod ki Sundi)

Termite: In the area of Kallur Kot, 35 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 26.5) had adopted the practices from the attack of Termite using Chloropyrifos 40ec chemical while 97 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 73.5) had not adopted the practices from the attack of Termite. Gross hopper: In the area of Kallur Kot, 32 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 24.2) had adopted the practices from the attack of Gross hopper using Befenthrin 10ec chemical while 100 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 75.8) had not adopted the practices from the attack of Gross hopper. In the area of Kallur Kot, 31 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 23.5) had adopted the practices from the attack of cut worm using Befenthrin 10ec chemical while 101 percent of the answerer of the tested sample (the total percentage of answerer of tested sample in Kallur Kot is 76.5) had not adopted the practices from the attack of cut worm. In the area of Kallur Kot, 26 percent of the answerer of tested sample (the total percentage of answerers of tested sample in Kallur Kot is 19.7) had adopted the practices from the attack of Aphid using Imidacloprid 200SL chemical while 106 percent of the answerer of tested sample (the total percentage of answerer of tested sample

in Kallur Kot is 80.3) had not adopted the practices from the attack of Aphid. Army Worm: In the area of Kallur Kot, 43 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 32.6) had adopted the practices from the attack of Army Worm using Emamectin 1.9ec chemical while 89 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 67.4) had not adopted the practices from the attack of Army Worm. Pod Borer: In the area of Kallur Kot, 31 percent of the answerer of the tested sample (the total percentage of answerer of tested sample in Kallur Kot is 23.5) had adopted the practices from the attack of Pod Borer using Emamectin 1.9ec chemical while 101 percent of the answerer of tested sample (the total percentage of answerer of tested sample in Kallur Kot is 76.5) had not adopted the practices from the attack of Pod Borer.

6. Conclusions and Recommendations

Farmers were having threats from the insects who can ruin their crop but due to less education they had less awareness to prevent their field from the insect attack, so due to less awareness the farmer was not having the best knowledge about chemicals and their adoption level were low in the usage of chemical for the insects. This study concluded that insects and diseases highly affected the gram crop and its production, and the farmer has been illiterate that's why they had less knowledge about pests and diseases and their prevention. The public and private sectors should take the matter seriously and should develop heat resistant varieties of chickpea against pests and diseases. Awareness comapign should be launched and proper measures should be taken in Punjab so that farmers can improve the gram production.

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