J Krishi Vigyan 2020, 9 (1) : 114-117 DOI : 10.5958/2349-4433.2020.00145.2

Evaluation of Chickpea (*Cicer aritinum* L.) Varieties against Wilt Disease in North Eastern hilly Zone of Tamil Nadu

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ABSTRACT

Chickpea (*Cicer aritinum* L.) is the major rainfed pulse crop cultivated in the hill areas of Vellore district in Tamil Nadu. However the productivity is highly limited by Chickpea wilt disease incited by *Fusarium oxysporum* f. sp. *ciceris* and causes heavy losses (37-45%) depending upon infection stage and soil type. The availability of drought tolerance, wilt resistant and high yielding varieties was major constraint in chick pea cultivation. An investigation was carried out to identify suitable high yielding varieties for Yelagiri region during *Rabi* 2017-18. The study revealed that chickpea variety GBM 2 recorded higher seed yield of 968 kg/ha with the minimum disease incidence of 8.5 per cent. The maximum number of pods per plant (22.0) was recorded in GBM 2 variety compared to other varieties. The highest wilt incidence 17.2 per cent recorded in chickpea variety CO-4. Higher net return of Rs. 29,810 /ha and benefit cost ratio of 3.15 was recorded in GBM 2 compared to the other varieties. The investigation concluded that GBM 2 was found to be suitable variety for Yelagiri Hill region due to minimum wilt incidence and high seed yield. Considering the above facts, GBM 2 would be a better variety to the farming community for enhancing the productivity of Chickpea for Yelagiri hills in Vellore district of Tamil Nadu.

Key Words: Drought, High yield, Productivity, Wilt resistant

INTRODUCTION

Chickpea (*Cicer aritinum* L.) is a drought tolerant leguminous crop used in various foods in several developing countries including India as a source of highly digestible (70-90%) dietary protein. Chickpea as a legume crop plays a significant role in improving soil fertility by fixing the atmospheric nitrogen (Kuldeep Balai, 2017). Average yields in North India are around 800 kg/ha as compared to only 400 kg/ha in south India. The area under Chickpea cultivation is drastically reduced over a decade of time. The *Fusarium* wilt caused by *Fusarium oxysporium* is one of the destructive soil and seed borne disease of chickpea (*C. arietinum* L.) and drastically reduced the plant population. The yield losses encountered due to wilt may vary between 37 to 45 per cent. The pathogen is both seed and soil borne; facultative saprophyte and can survive in soil up to six years in the absence of susceptible host. Most of the resistant varieties have been found to be susceptible after some years because of breakdown in their resistance and evolution of new races of the pathogen (Ayyub *et al,* 2003). This disease has been reported from 33 countries of the world causing 10-15 per cent yield losses annually depending upon the environment condition (Biswas and Jubayer ali, 2017). Many farmers are growing Chickpea crops by using local varieties and keep the seeds for next season also. The seed yield of chickpea is highly dependent on plant population which can be manipulated to obtain the maximum seed yield per land area depending on variety, its growth habit and agro climatic condition (Kumar *et al*., 2015). Due to the continuous cultivation of the same and local

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Table 1.Chickpea varieties and its special features.

Chickpea variety	Special features
GBM 2	Duration (95 to 100 days), Seed yield of 1600 kg/ha under rainfed condition Moderately resistant to wilt, Erect type and released by UAS, Raichur 2014
ICCV 05106	Duration (90-95 days), Seed yield of 1750 kg/ha under rainfed condition, semi-erect growth habit, highly resistant to *Fusarium* wilt and released by ICRISAT, Hyderabad, 2016
CO -4 (Local check)	Duration (85-90 days), seed yield of 1567 kg/ha under rainfed condition and released by Tamil Nadu Agricultural University, Coimbatore, 1998

varieties leads to the reduction in yield. Therefore, the present study was conducted to identify the suitable drought tolerance, wilt resistant and high yielding chickpea varieties for the North Eastern hilly Zone of Tamil Nadu.

MATERIALS AND METHODS

The present study was carried out by Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Vellore in the Yelagiri hill which is located in North eastern Zone of Tamil Nadu during the *Rabi* season 2017-18 the ten selected farmer's field. On the receipt of monsoon, the sowing was performed by the farmers as per the scientist guidelines. Two improved varieties like GBM 2 and ICCV 05106 selected with the local check of CO-4 Chickpea were taken for the trial purpose. The special features of the selected varieties are presented in Table 1. Each chickpea variety was sown on an area of 0.4 ha. at each farmer's field. Before implementing the trials all the selected farmers were trained on how to use the technologies for improving the productivity per unit area. Two hand heeding were done to keep the crop weed free condition. Irrigation was not given as the crop was raised as rain fed crop. The trial was laid out in randomized block design (RBD) with three treatments and five replications and data were analysed statistically. Five plants were selected at random from each plot for recording observation. Days to 50 per cent flowering was recorded by counting the total number of days required for 50 per cent of the total population to reach flowering stage, days to physiological maturity was recorded by counting number of days required the entire plants to reach yellow and dry stage, number of pods per plant was recorded by counting the total number of pods per plant, seed yield by taking the total seed yield from each variety. The periodical observations on growth and yield contributing characters of Chickpea and wilt incidence percentage, economics of all the varieties were recorded.

Wilt incidence (%): Was recorded as proportion of plants showing wilt symptom out of the total plants per plot and per plot both at seedling and reproductive or flowering stage.

Wilt incidence (%) = Number of plants showing disease symptoms / Total number of plants assessed X 100

RESULTS AND DISCUSSION

Plant height

The data (Table 2) show that the plant height was significantly higher under GBM-2 (38.3 cm) followed by ICCV 05106 (32.0 cm) and minimum plant height was recorded under CO-4 (30.1 cm). Variation among the varieties in respect of plant height appears due to genotypic variation. The results were in agreement with the findings of Alkadev *et al* (2017).

Days to 50 per cent flowering and physiological maturity

Significant differences in days to 50% flowering and physiological maturity were observed among all the varieties (Table 2). Those varieties with a short lifespan would reach flowering and maturity within short periods compared to long duration

Table 2.Growth and yield attributes of Chickpea varieties at North Eastern hilly Zone of Tamil Nadu

Parameter	Plant height (cm)	Plant population/ m^2	Day to 50% flowering (Days)	Physiological maturity (Days)	No. of pods/ plant	Wilt Incidence (%)	Yield (kg/ ha)
GBM 2	38.3	20.0	54	96	22.0	8.5	968
ICCV 05106	32.0	17.0	56	94	19.5	11.5	816
CO-4	30.1	14.0	48	85	16.1	17.2	794
SEd	0.081	0.053	0.09	0.102	0.067	0.035	81.2
CD (P=0.05%)	0.172	0.110	0.120	0.20	0.120	0.141	164.7

varieties. In the present study also, the variety CO-4 took significantly lesser time (48 days) for attaining 50 per cent flowering as well as physiological maturity whereas the variety ICCV 05106 took longer time (56 days) for both 50 per cent flowering and physiological maturity. However, GBM-2 was on par with ICCV 05106 for 50 per cent flowering and physiological maturity.

Number of pods per plant

It was noticeable that number of pods per plant differed significantly in different chickpea varieties (Table 2). The variety GBM 2 recorded significantly higher number of pods per plant (22.0) followed by ICCV 05106. Minimum numbers of pods per plant were recorded by CO-4 (14.0). A direct relationship between numbers of pods per plant with seed yield was also noticed. The possible reason might be the improvement in number of pods per plant due to varietal characters. The variation in number of pods per plant was found due to the variation of branch production and the genetic variations of the varieties. Similar findings were also reported by Kabir *et al* (2008) who studied on growth and yield response of two chickpea varieties.

Plant population

Plant population per square meter area of chickpea recorded higher in GBM 2 (20.0) followed by ICCV 05106 (17.0). The variation in final plant population was due to the characteristics features of the variety and wilt tolerance of varieties. Plant population had a highly significant effect on the number of pods per plant (Table 2), where there was a significant linear decline with increasing plant population. Ahmadian *et al* (2005) showed that increasing the density of chickpea from 12 to 33 plants per square meter is accompanied with the higher grain yield in a dry land farming system.

***Fusarium* wilt incidence**

Among three types of chickpea varieties screened against *Fusarium* wilt, the highest percentage of

Table 3. Economics for Chickpea varieties at North Eastern hilly Zone of Tamil Nadu

Parameter	Gross cost (Rs./ha)	Gross Return (Rs./ha)	Net return (Rs./ha)	Benefit cost ratio
GBM 2	13750	43560	29810	3.17
ICCV 05106	13758	36720	22962	2.67
CO-4	14240	35730	21490	2.51

incidence (17.2 %) was recorded from the variety CO-4 and the lowest incidence (8.5%) was from the variety GBM 2. Demisew (2010) reported that new varieties have better performance and higher degree of genetic potential for disease resistance than old varieties. The cultivation of resistant cultivars was the most effective and economical way for controlling the wilt disease. All three genotypes were shown resistance against new races of isolates; they may have multiple genes of resistance to this descriptive disease. The decreased yield in late sown chickpea was probably due to the interaction between inherent genetic potential of crop and environment (Biswas and Jubayer ali, 2017).

Seed yield

Data pertaining to the seed yield elucidate a significant difference between chickpea varieties. Higher seed yield (968 kg/ha) was obtained from GBM 2 while lower seed yield (794 kg/ha) was recorded from the variety CO-4 (Table 2). The higher seed yield of GBM 2 might be due to better contribution of growth and yield contributing characters like plant population, plant height, low wilt incidence and number of pods per plant as compared to ICCV 05106 and CO-4. Usually varieties with longer growth duration produce more yield than the varieties with shorter growth duration. Hence daily productivity may be abettor criterion for comparing varietal performance. Munirathnam *et al* (2013) also reported yielding variation in chickpea varieties.

Economics

Among the Chickpea varieties, higher yield and market preference was high for GBM 2 variety due to bold and colour of the seed and fetched higher prices. GBM 2 recorded the highest net profit of Rs. 29810/ha with the benefit to cost ratio of 3.17 followed by ICCV 05106 (Rs.22962/ha, 2.67) while the local check registered the lowest net profit of Rs. 21490/-ha and benefit cost ratio of 2.51.

CONCLUSION

It was concluded that GBM 2 recorded higher seed yield, high production of pods per plant and was at par with ICCV 05106. But higher return and benefit cost ratio recorded in GBM 2 and the farmers were satisfied with GBM 2 due to its erect type and moderately resistant to wilt, Therefore, GBM 2 chickpea variety would be identified as a better chickpea variety for North Eastern hilly Zone of Tamil Nadu and suggested for large scale cultivation.

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Received on 19/11/2020 *Accepted on 25/12/2020*