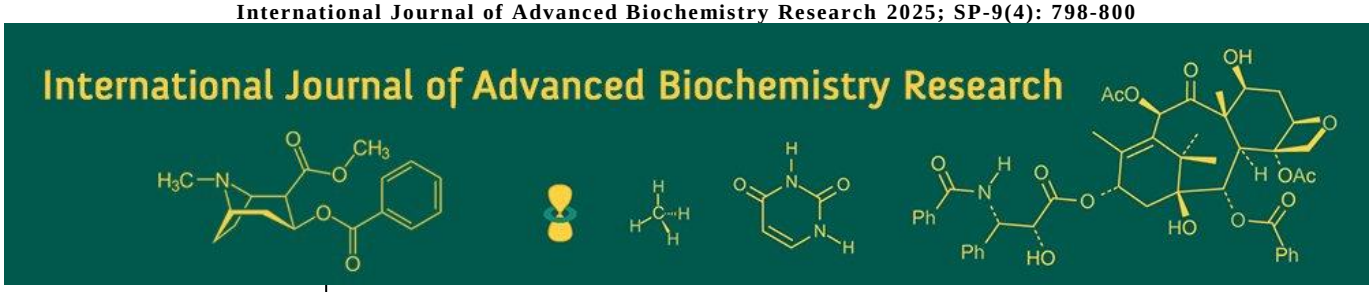

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Evaluation of performance of chickpea genotypes for higher productivity under vertisol of Kalaburagi district, Karnataka

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Abstract
On farm trial (OFT) on farmers field was conducted to assess the performance of different varieties of chickpea (*Cicer arietinum* L.) in black cotton soils at Kalaburgi district of Karnataka, under the jurisdiction of ICAR-KVK, Kalaburgi-2, in the blocks of Jewargi and Chittapur of three villages with three farmers field during the 2021-22 and 2022-23. The OFT consists of three varieties of chickpea *viz*., Annigeri -1, BGD-111-1 and NBeG-3 and adopted standard package of practices recommended for chickpea for the region by UAS, Raichur. Among the tested varieties higher yield parameter, higher number of pods per plant (38.2) and pod weight per plant (17.16) and yield (3651 kg ha^{-1}) was recorded in var. NBeG-3 compare to Annigeri-1(2945 kg ha^{-1}) and BGD-111-1(3064 kg ha^{-1}). Similarly with respect economics to higher gross returns (1,25,594), net returns (87,594) and B C ratio (3.31) were recorded with NBeG-3, followed by BGD-111-1, gross returns (1,05,402), net returns (69,902) and B C ratio (2.97) and lowest yield parameter, yield and economics gross returns (1,01,308), net returns (66,508) and B C ratio (2.91) were recorded in Annigeri-1.

Keywords: Chickpea genotypes, productivity and economics

Introduction
Pulses are rich and predominating source of protein with recommended dietary allowances for adult male and female is 60 g and 55 g per day, while its per capita availability is only 42 g per day (Anonymous 2019) [2]. Pulses are grown worldwide on an about 85.40 m ha with a production of 87.40 (Mt) at 1023 kg ha^{-1} yield level. India ranks first in term of area (29.3 M ha) and production (245 lakh tones) with 34 per cent and 26 per cent contribution, respectively (Anonymous 2018) [3]. India is the largest producer and consumer of pulse with maximum area coverage in the world. Yet, with stagnation of production in spite of increase in demand, there has been an increasing demand supply gap for pulse in India which creates huge economic loads in term of import to meet out the domestic demands. In order to ensure self- sufficiency, the pulse requirement in the country is projected to be about 39 million tons by year 2050 which necessitates adoption of chickpea as a suitable option in *Rabi* season for higher crop productivity and profitability with improved soil health. Chickpea (Cicer *arietinum* L.) is an important leguminous crop used in preparation of wide variety of foods in several developing countries including India as a source of highly digestible (70-90%) dietary protein. Chickpea plays a significant role in improving soil fertility by fixing the atmospheric nitrogen (Kuldeep Balai, 2017) [4]. In India, chickpea occupies an area of 9.40 million ha. with a production and productivity of 10.13 million tones and 1073 kg/ha, respectively. In South India, the average yield of chickpea is only 50% to that of in North India. In Karnataka, chickpea occupies an area of 1.09 million ha. with a production and productivity of 0.57 million tones and 525 kg/ha, respectively. Among different legumes chickpea occupies the third position in the world after dry beans and dry peas. Ali and Kumar (2001) [1] has quoted that nearly 90% of the global area and production is mainly confined to Asia. Further, it is also being grown in the Mediterranean Region, the West Asian and North African Region, North and Central America and Eastern Africa. Recently, it has expanded to Australia and Canada. In semi-arid tropics and in spring and winter seasons in the temperate and Mediterranean types of climate, chickpea has grown mostly as a rainfed crop under conserve moisture in the post rainy season (Ali and Kumar, 2001) [1].

Chickpea being cultivated in a rainfed situation especially on scarce soil moisture during winter season with traditional varieties thus the productivity enhancement has remained a major challenge for several decades. The remarkable increase in area and productivity of pulses is not observed as it is witnessed in other commodities over the years. There are technological breakthroughs, which promise to raise the productivity, needs to be demonstrated at farmers' fields with their active participation that build confidence in new technologies. Keeping this in view, OFT of new chickpea genotypes were conducted in order to demonstrate the productivity potential and economic benefit of improved varieties under rainfed condition on farmers' field conditions.

Materials and Methods

As a part of on farm testing of ICAR-KVK, Kalaburgi-2 conducted field trials in the three farmers field in each year during the 2021-22 and 2022-23, blocks of Jewargi and Chittapur of three villages with three farmers of Kalaburgi District. The soils of OFT was medium to deep black soils and three cultivars were sown with spacing of 30 X 10 cm at 5 cm depth and improved package of practices were adopted like weeding with pre-emergent application of pendimethalin 37.8 CS at the rate of 2.5 ml per litter and followed by one hand weeding, applied recommended dose of fertilizer in the form of di ammonium phosphate (DAP), Urea and Zn so_4 to each plot and variety. Three varieties were used in the on farm testing *viz*., Annigeri -1, BGD-111-1 and NBeG-3 (Table 1) at farmers field and each variety 30 kg seeds were used per trial and total of three trials were conducted in each year. The five randomly selected plants from each variety were used for recording the yield parameter, number of pods per plant and pod weight per plant was recorded and five by five meter area was selected from gross area harvested to record the yield and economic were worked out like cost of cultivation worked out by taking into prevailing market prices of all the inputs involved including the manual labour engaged and gross returns, net returns and BC ratio were worked out by taking into prevailing market sale price.

Table 1: Special characteristics of genotypes

Variety/Special feature	A-1	BGD-111-1	NBeG- 3
Days to maturity	90-95 days	95 days	110 days
Yield (kg ha^{-1})	1500-1600	1600-1700	2300
Disease and pest reaction	-	Moderately resistant to Fusarium wilt and tolerant to dry root rot.	Tolerant to wilt
Special character	Drought resistant	Bold seeded desi type	Large seeded desi variety tolerant to drought with good rooting quality

Results and Discussion

Yield Attributing Characteristics

The yield attributing parameter like the days to 50% flowering, test weight, number of pods per plant and pod weight per plant of different chickpea genotypes are depicted in the table 2. The higher number of days to 59% flowering was recoded in variety BGD-111-1 (65-70 DAS) compare to Annigeri-1 (60-65 DAS) and among the three varieties under testing least number of days were recorded in NBeG-3 (55-60 DAS). With respect to test weight (100 seed weight) higher test was recoded in the variety BGD-111-1 (31 g) followed by NBeG-3(24.5 g) and lowest test weight was recorded in variety Annigeri-1. The important yield attributing character which contributing to the final yield was number of pods per plant, Among the tested varieties higher number of pods per plant were noticed with NBeG-3 (38.2) followed by BGD-111-1 (32.2) and lower number of pods per plant was recorded with variety Annigeri-1 (29.8). With respect to pod weight per plant among the tested genotypes higher pod weight was recoded with the variety NBeG-3(17.16 g per plant) followed by BGD-111-1 (14.37 g per plant) and lowest yield was recorded with variety Annigeri-1 (13.84 g per plant). This variation may be due to varietal characters of improved varieties and similar variation of yield parameter were recoded by Kabir *et al*, (2008) and Sunil *et al*. (2024) [8].

Table 2: Yield parameter of chickpea genotypes under vertisol of Kalabugri district

Genotypes	Days to 50% flowering	Test weight (g)	. No. of pods per plant	Pod weight per plant (g)
Annigeri-1	60-65	23.75	29.8	13.84
BGD-111-1	65-70	31.0	32.2	14.37
NBeG-3	55-60	24.5	38.2	17.16

Yield and Economics

The seed yield varied with different genotypes under on farm test (Table 3). Among the different varieties under on farm testing higher seed yield was recorded with variety NBeG-3 (3651 kg ha^{-1}) followed by the variety BGD-111-1 (3064 kg ha^{-1}) and lowest yield was recorded with old variety Annigeri-1 (2495 kg ha^{-1}) the increase in yield was mainly due to increase in yield parameter like number of pods per plant and pod yield per plant similar increase in yield was noticed by (Patil *et al*., 2016) [6] and (Sunil *et al*., 2024) [8]. Among the different genotypes under study higher gross returns (Rs. 1,25,594 ha^{-1}), net returns (87,594 ha^{-1}) and BC ratio (3.31) were recorded with variety NBeG-3 followed by BGD-111-1. Lowest economics parameters were recorded with variety Annigeri-1, gross returns (Rs. 1,01,308 ha^{-1}), net returns (66,508 ha^{-1}) and BC ratio (2.91) these results were in line with finding of Srinivas *et al*. (2005) [7] and Sunil *et al*., 2024 [8]

Table 3: Yield and economics of chickpea genotypes under vertisol

Genotypes	Seed Yield (Kg ha^{-1})	Gross cost (Rs.ha^{-1})	Gross Return (Rs.ha^{-1})	Net profit (Rs.ha^{-1})	BC Ratio
Annigeri-1	2945	34800	101308	66508	2.91
BGD-111-1	3064	35500	105402	69902	2.97
NBeG-3	3651	38000	125594	87594	3.31

Conclusion

From the fore going results and discussion it can be concluded that for the black vertisols of north Karnataka, Kalaburgi district for obtaining higher yield and economic returns in chickpea the variety NBeG-3 can be cultivated which matures early and found superior to Annigeri-1 and BGD-111-1 with respect to yield and economics.

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