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Assessment of Chickpea varieties suitable for mechanical harvesting & higher productivity under vertisols of Kalaburgi District

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Abstract
ICAR-KVK, Raddewadgi- conducted on farm testing (OFT) during the year 2022-23 under the jurisdiction of ICAR-KVK, Kalaburgi-2. Kalaburgi district is one of the major chickpea growing district in Karnataka state, however there is acute shortage of labour especially for weeding and harvesting in chickpea. Hence on farm testing of chickpea genotypes suitable for mechanical harvesting was planned and conducted under vertisols of Kalaburgi district in the blocks of chittapur (Malaga village) and Jewargi (Rasanagi village) the total number of trials conducted three under farmers field. The oft consists of three varieties of chickpea *viz*., GBM-2, Phule Vikram and NBeG-47 suitable for mechanical harvesting and one leading high yielding variety of chickpea of the region i.e. JG-11 as test variety. The results of the experiment indicated that among the genotypes suitable for mechanical harvesting higher seed yield was noticed in NBeG-47 (1650 kg ha^{-1}) compare to GBM-2 (1580 kg ha^{-1}) and Phule Vikram (1520 kg). However more marginally higher seed yield was recorded in JG-11(1720 kg ha^{-1}). With respect economics among the varieties suitable for mechanical harvesting higher gross returns and net returns were recorded with NBeG-47 (Rs. 66,000 and 43,500 ha^{-1}, respectively) followed by GBM-2 (Rs. 63,200 and 39,700 ha^{-1}, respectively) and Phule Vikram (Rs. 60,800 and 37,800 $kgha^{-1}$, respectively) and Highest gross returns and net returns were recorded with JG-11(Rs.68,800 and43,800 ha^{-1}, respectively). Whereas highest BC ratio (2.93) was recorded with NBeG-47 followed by JG-11(2.75), GBM-2(2.69) and lowest was recorded with Phule Vikram (2.64). For getting higher returns for rupee invested farmers can cultivate NBeG-47 and for higher net returns JG-11can be cultivated.

Keywords: Chickpea, mechanical harvesting, vertisols, productivity

Introduction
Chickpea (*Cicer aritinum* 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]. India is the largest producer and consumer of chickpea (*Cicer arietinum* L.) in the world. It is grown an area of about 9.85 million hectares with a production of 10.32 million tonnes and a productivity of 1048 kg ha-1 (Directorate of Economics and Statistics, 2019). 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 tonnes and 525 kg/ha, respectively.
Increasing cost of labour is a major problem in India because of which cost of chickpea cultivation increases and labour scarcity during the time of harvesting leads to delayed harvesting of pods consequently which leads to seed deterioration and loss of yield. Therefore, mechanical harvesting is preferred by farmers over manual harvesting. To reduce production costs and complete operations on time, any crop must be harvested in an economically feasible way. Machine harvesting is better to manual harvesting since it takes less time and labour to complete. The chickpea is a very significant food legume crop in India and manual harvesting is the main factor in its high production costs. The increased productivity of chickpea in developed countries like Australia, Canada and USA is mainly attributed to the mechanized harvesting (Oram & Belaie 1990, Osrnan *et al*. 1990) [6, 7]. Hence there is an increasing demand for developing chickpea cultivar suitable for mechanisation.

Materials and Methods

The present on farm testing of chickpea genotypes suitable for mechanical harvesting and higher productivity was conducted as part of on farm testing of ICAR-KVK, Kalabugi-2 during the year 2022-23 in the farmers' fields of Jewargi and Chittapur blocks of Kalaburgi district under the jurisdiction of kvk, Kalaburgi-2. The soils of the experimental site were medium to deep black soils with low in nitrogen, low to medium in phosphorus and high in potash content. The trial was conducted in farmers field and 30 kg seeds of each variety *viz*., GBM-2(Released from, UAS, Raichur), Phule Vikram (MPKV, Rahuri) and NBeG-47(ARS, Nandyal, AP) suitable for mechanical harvesting and one leading high yielding variety of chickpea of the region i.e. JG-11(UAS, Raichur) as test variety (Table-1). Recommended package of practices of chickpea from UAS, Raichur was adopted. The growth observation like plant height and days to 50 per cent flowering was recorded and yield observation like test weight and number of pods per plant were recorded and for calculating final yield per hectare net plot of 5x5 meter was harvested and same was used for estimation of seed yield per hectare. The economic parameter 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, cost involved in mechanical harvesting and gross returns, net returns and BC ratio were worked out by taking into prevailing market sale price during the cropping period.

Table 1: Special characteristics of the chickpea varieties under on farm testing

Variety / Special feature	JG-11	GBM-2	Phule Vikram	NBeG-47
1. Growth habit	Semi spreading	Semi spreading	Semi erect	Semi erect
2. Flower colour	pink	pink	pink	pink
3. Seed colour	Dark brown	brown	brown	brown
4. Yield (kg ha-1)	1500-1700	1500-1600	1500-2000	2000-2200
5. Days to maturity	95-100 days	100-110	95-100 days	105-110
6. Disease and pest reaction	Resistant to wilt Moderately resistant to root rot	-	Resistant to fusarium wilt	Resistant to wilt
7. Mechanical harvesting	-	Suitable	Suitable	Suitable

Results and Discussion

Growth and yield parameters

Results of the growth and yield parameters of the trials are presented in table 2, and results revealed that plant height of chickpea differed with varieties under trial among the different varieties higher plant height (54.94 cm) were recorded with NBeG-47 followed by GBM-2(44.38cm), Phule Vikram (42.34 cm) and least was recorded with JG-11(34.46 cm).The days to 50 per cent also differed with varieties less number of days for 50% flowering was recorded in NBeG-47 (55-60 days) followed by Phule Vikram and JG-11both recorded (60-65 days) and more number of days for 50% flowering noticed in GBM-2 (65-70 days). The present findings were in accordance with Parameshwarappa *et al*. (2012) [8] for plant height and days to 50% flowering and with Alkadev *et al*. (2017) [1] and both for plant height and days to 50% flowering (Basha *et al.,* 2020) [2], Yield parameters like test weight and number of pods for differ with different genotypes under trial presented in table-2. Test weight varied differently with varieties under trial higher test weight was recorded with NBeG-47 (26.4 g) followed by JG-11(24.5 g), GBM-2 (23.5) and lower test weight (22.5 g) with Phule Vikram. With regards to number of pods per plant the varieties suitable for mechanical higher number of pods per plant was recorded in NBeG-47 (27.3) followed by GBM-2(22.5) and highest number of pods per plant was recorded in JG-11(32.8). Seed yield differ with varieties under trial among the varieties suitable for mechanical harvesting NBeG-47 recorded higher seed yield (1650 kg ha^{-1}) followed by GBM-2(1580 kg ha^{-1}) and lowest yield was recorded in variety Phule Vikram (1520 kg ha^{-1}) the highest yield was recorded in the variety JG-11(1720 kg ha^{-1}) these results are in line with findings of Basha *et al.* 2020 [2].

Table 2: Growth and yield parameter of chickpea genotypes suitable for mechanical harvesting under vertisol of Kalabugri district

Genotypes	Plant height (cm)	Days to 50% flowering	Test weight (g)	No. of pods per plant	Seed Yield (Kg ha^{-1})
JG -11	34.46	60-65	24.5	32.8	1720
GBM-2	44.38	65-70	23.5	22.5	1580
Phule Vikram	42.34	60-65	22.5	21.7	1520
NBeG-47	54.96	55-60	26.4	27.3	1650

Table 3: Economics of chickpea genotypes suitable for mechanical harvesting under vertisol of Kalabugri district

Genotypes	Gross cost (Rs.ha^{-1})	Gross Return (Rs.ha^{-1})	Net profit (Rs.ha^{-1})	BC Ratio
JG -11	25000	68800	43800	2.75
GBM-2	23500	63200	39700	2.69
Phule Vikram	23000	60800	37800	2.64
NBeG-47	22500	66000	43500	2.93

Economics

The data on economics of different varieties are presented in table 3. Among the different varieties suitable for mechanical harvesting higher gross returns and net returns were recorded with NBeG-47 (Rs. 66,000 and 43,500 ha-1, respectively) followed by GBM-2 (Rs. 63,200 and 39,700 ha-1, respectively) and lower gross returns and net returns were recorded with Phule Vikram (Rs. 60,800 and 37,800 kgha-1, respectively) and Highest gross returns and net returns were recorded with JG-11 (Rs.68,800 and43,800 ha-1, respectively). Whereas highest BC ratio (2.93) was recorded with NBeG-47 followed by JG-11(2.75), GBM-2(2.69) and lowest was recorded with Phule Vikram (2.64). Similar increase in BC ratio was reported by Madhuri *et al*.2023 [5].

Conclusion

From the foregoing results and discussion it can be concluded that for getting higher returns for rupee invested farmers can cultivate variety suitable for mechanical harvesting NBeG-47 and for higher yield and net returns chickpea variety JG-11can be cultivated.

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