

Short Communication

Suitability of chickpea 'NBeG47' for mechanical harvesting under rainfed condition

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ABSTRACT

A field experiment was carried out at Regional Agricultural Research Station, Nandyal during rabi seasons of 2012-13 and 2013-14 to study the suitability of chickpea 'NBeG47' for mechanical harvesting through standardising its appropriate plant density and optimum nitrogen levels. The variety recorded significantly higher seed and haulm yields at a plant density of 55/m² (on par with those in 44/m²) as compared to 33/m². However, different levels of nitrogen did not influence its seed yield, its attributes or other plant biometrics.

Key words: Chickpea, Erect plant type, Nitrogen levels, Plant geometry

Mechanization of diverse farm operations right from planting of seed in fields to storage of seeds is vital for improving efficiency of production agriculture and reducing cost of cultivation. Sowing of many field crops including pulses is now progressively being carried out by seed drills in India. Similarly many other farm operations are being gradually taking the help of machines due to scarce availability of costly labour especially at the time of need. The requirement of machine is more likely in a situation where there is a need for quick harvesting of the current crop standing in the field and a quick sowing of another crop in succession. Here it necessitates the use of harvesting machine or combines as in case of crops like, wheat and rice where it has been a boon.

In addition, with continuously increasing labour cost, manual harvesting has become an expensive and time taking field operation for any crop in India. Therefore it necessitates the use of mechanical harvesting. Chickpea (*Cicer arietinum* L.) is the foremost important pulse crop growing all over the country during Rabi season. Among states in India, Andhra Pradesh contributes significantly to the National pool as compared to other states as the crop is grown in the state in an area of 3.44 lakh hectares with the productivity of 1050 kg/ha. The problem arises when the crop needs to be manually harvested as the available cultivars are not suitable to mechanical harvesting. It is mostly attributed to low height of the crop (low plant height) and closeness of the branches to ground (with semi-spreading growth habit). Hence, there is a need

to develop tall and non-spreading plant type with pods borne considerably above the ground level. This in turn will be amenable to mechanical harvesting at a low cost (of cultivation).

In this regard, chickpea 'NBeG47' - a cultivar with more plant height & erect type- was developed and released from Regional Agricultural Research Station, Nandyal, Acharya NG Ranga Agricultural University, Andhra Pradesh. The seed yield of chickpea is highly dependent on plant population (Ayaz *et al.* 1999) which can be manipulated to obtain the maximum seed yield per unit land area depending on variety, its growth habit and agro-climatic condition (Kumar *et al.*, 2015). As 'NBeG47' differs in its morphology as compared to existing cultivars, its requirements for row spacing and fertility may be different. Therefore, the current experiment was planned with an objective of having high density planting so that it could lead to increased production per unit area due to its erect nature although over population beyond the threshold level could often led to competition for nutrients resulting in poor growth and low seed yield.

Being a leguminous crop, chickpea meets significant portion of its nitrogen requirement through symbiotic N₂ fixation (4-85%) when grown in association with effective and compatible *Rhizobium* strains (Saini *et al.* 2004; Rudresh *et al.* 2005). Study shows that it could improve soil fertility by fixing atmospheric nitrogen up to 99 kg/ha (Schwenke *et al.* 1998). However, a starter dose of N fertilizer could stimulate early growth of leguminous crops as it could induce the activity of nitrogen fixing bacteria (Ali *et al.* 1998). Similarly, a higher dose of N might be useful for the increased plant population as result of high plant density which needed for the present investigation on redefining the need for present starter dose recommendation (of 20 kg N/ha) in case of increased plant stand. In this regard, the present investigation was taken up to assess the effect of high density planting and variable starter dose of nitrogen for chickpea 'NBeG47' amenable to mechanical harvesting.

A field experiment was conducted at Regional Agricultural Research Station, Nandyal, Kurnool district, Andhra Pradesh during Rabi 2012-13 and 2013-14. The soil texture is a deep clay with organic carbon of 0.56%, low nitrogen (205 kg/ha), high phosphorus (42 kg/ha) and

Table 1. Effect of different treatments on yield attributing characters, seed & haulm yields and Harvest Index (HI) of chickpea cultivar NBeG 47.

Treatments	Plant height at harvest (cm)		Branches/plant		Pods/plant		Test weight (g)		Seed yield (kg/ha)		Haulm yield (kg/ha)		Harvest Index	
	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14
<i>Plant density/m² (spacing)</i>														
33 (30 x 10 cm)	53.6	52.7	8.6	9.6	25.1	26.8	30.7	32.4	1977	2259	2335	2769	0.46	0.45
44 (30 x 7.5 cm)	53.0	52.2	6.4	6.7	22.7	22.0	30.5	32.1	2200	2476	2558	3096	0.46	0.44
44 (22.5 x 10 cm)	53.4	50.7	7.5	7.6	23.4	23.4	30.7	31.3	2364	2559	2622	3187	0.47	0.45
59 (22.5 x 7.5cm)	52.9	49.4	7.5	8.0	19.2	20.2	31.3	31.6	2369	2672	2727	3423	0.46	0.44
SEm(±)	1.1	0.5	0.4	0.4	1.0	0.6	0.3	1.3	57	38	60	46	-	-
CD (P=0.05)	NS	1.9	1.3	1.4	3.1	1.3	NS	NS	196	132	183	138	-	-
<i>N levels (kg/ha)</i>														
20	53.8	50.4	6.9	8.0	22.5	22.2	31.0	31.7	2182	2471	2464	3069	0.47	0.45
30	52.4	50.9	7.8	7.6	22.4	23.2	30.8	30.2	2325	2508	2683	3164	0.46	0.44
40	53.5	51.7	8.2	8.4	24.1	23.9	31.0	31.6	2176	2496	2534	3121	0.46	0.44
SEm(±)	0.6	0.4	0.3	0.5	1.0	0.9	0.2	1.2	56	35	58	43	-	-
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-	-

potassium (410 kg/ha). The experiment consisted of twelve treatment combinations of four plant densities 33 plants/m² (30 x 10cm), 44 plants/m² (30 x 7.5cm), 44 plants/m² (25 x 10cm) and 59 plants/m² (25 x 7.5cm) and three nitrogen levels *viz.*, 20, 30 and 40 kg N/ha; and were replicated three times in a split plot design with a gross plot size of 13.44 m². Seeds of 'NBeG47' were sown by dibbling with a single seed per hill. In each season, normal cultural practices for raising successful chickpea crop were applied. The recommended dose of nitrogen fertilizer was applied as per treatments in the form of urea. A dose of 50 Kg P₂O₅/ha was applied as single super phosphate at the time of seed bed preparation. Irrigation was given at 55 days after sowing because of inadequacy in rainfall events. The crop protection measures were taken up and the crop was harvested at maturity.

During 1st year (2012-13), plant height at harvest was not influenced either due to planting density or nitrogen levels although maximum (53.6 cm) and minimum (52.9 cm) plant height were obtained at the plant density of 33/m² (30 x 10cm) and 59/m² (22.5 x 7.5cm) respectively. However, during 2nd year (2013-14), significantly higher plant height (52.7cm) was recorded at a plant density of 33/m² following a row spacing of 30 x 10cm (on par with 44/m²) as compared to 59/m² at 22.5 x 7.5cm (49.4 cm plant height). The increase in height at 33/m² might be due to availability of resources or inputs (sunlight & nutrients); and was again in disagreement with the notion that increased plant population might lead to increased plant height due to competition for sunlight. From the study, it could be inferred that increased planting density of 'NBeG47' to an extent of 59/m² from 33/m² could not compete for sunlight due to its erect morphology as maximum plant height (Table 1) was recorded at a plant density of 33/m².

In addition, plant density of 33/m² (30 x 10cm) recorded significantly higher number of branches/plant during both the years (on par with 55/m²) as compared to 44/m² (30 x 7.5cm). Across the years of study, significantly higher number of pods/plant were also recorded with plant density of 33/m² (30 x 10cm) over 59/m² (22.5 x 7.5cm). However, there was no significant variation in pods/plant recorded with 44/m² obtained either at 30 x 7.5cm or 22.5 x 10 cm. Similarly, 100 seed weight was not influenced due to varied planting densities (Table 1).

Besides growth and yield attributes, seed yields realized during both the years of experimentation clearly indicated a yield advantage at a plant density of 55/m² at a row spacing of 22.5 x 7.5cm (on par with 44/m²) compared to 33/m² at 30 x 10cm. The increase in seed yield with 55/m² was in fact attributed to more plant population despite recording significantly lower pods/plant (Table 1). A similar result of increased seed yield by increasing plant population per unit area was reported by Rathore and Patel 1991. Similar trend was also observed with straw yields. However, higher HI was recorded with plant density of 55/m² (0.47 and 0.45 during 2012-13 and 2013-14, respectively). Contrary to row spacing, plant height at harvest, primary branches/plant, pods/plant, 100 seed weight, seed and straw yields were not influenced by different nitrogen doses during both the years. The interaction effect of plant densities and nitrogen fertilization was also not apparent.

From the above study, it could be inferred that chickpea 'NBeG47'-a cultivar suitable for mechanical harvesting-could perform well at a plant density of 55/m² with the recommended dose of 20 kg N/ha in the *vertisols* of Andhra Pradesh, India.

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