

**EFFECT OF HARVESTING TIME ON YIELD AND YIELD
ATTRIBUTES OF CHICKPEA (*Cicer arietinum* L.)**

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Abstract

Field experiments were carried out during 2004-2006 at Bangladesh Agricultural Research Institute Farm in Grey Terrace Soils, Agro-Ecological Zone (AEZ 28), Joydebpur, Gazipur, Bangladesh to determine the effects of harvesting time on yield and yield attributes of chickpea. Chickpea seeds of three varieties viz., BARI Chola-5, BARI Chola-6, and BARI Chola-8 were collected at three times viz., i) when the pods were yellowish with a few yellow greens (H₁ stage), ii) when most of the pods were light brown with a few yellow (H₂ stage), and iii) when all the pods were completely brown and dry (H₃ stage). All the seeds were stored in earthen pot until conducting the field study. Significant variation was not observed in three varieties of chickpea for most of the parameters studied. The highest pods/plant, seeds/pod, and seed yield were observed in BARI Chola-5 and the lowest in BARI Chola-8. Seeds collected at the stage when most of the pods were light brown with a few yellow (H₂ stage) recorded the highest pods/plant, seeds/pod, 1000-seed weight and seed yield. The highest seed yield was recorded from BARI Chola-5 when seeds were collected at H₂ stage.

Keywords: Chickpea, harvesting time, yield, yield attributes.

Introduction

Seed development and maturation study is important because the seeds may be harvested to ensure good yield associated with viability, vigour and field performance (Dharmalingam and Basu, 1990). Physiological changes might set in, if the seeds are retained on the mother plant for longer duration after physiological maturity which would lead to the development of hard seeds or off-colour seeds in pulse crops. Moisture content of harvested crop affects seed quality and hence it determines with which moisture content the crop should be threshed. Harvesting at high moisture content increases the chances of mycofloral infection on seed, while harvesting at low moisture content increases mechanical damage to seed (Yadav *et al.*, 2005). Early harvested seeds were immature and poorly developed and as such are poor storers compared to seed

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harvested at physiological maturity (Mahesha *et al.*, 2001). Seed yield and quality largely depends on the stage of maturity (Kumar *et al.*, 2002). As such, harvesting of seeds at right stage of maturity is most important since harvesting either at early or late stage results in lower yields with poor quality seeds. So, the experiment was conducted to determine the effects of harvesting time on yield and yield attributes of chickpea.

Materials and Method

Field experiments were carried out at the Research Field of Pulse Research Centre, Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, Bangladesh during *rabi* season of 2004-05 and 2005-06. The area belongs to the Agro-ecological Zone (AEZ 28) under Madhupur Tract. The experimental site is situated at 24.00° North Latitude and 90.26° East Longitude. Chickpea seeds of three varieties viz., BARI Chola-5 (V₁), BARI Chola-6 (V₂), and BARI Chola-8 (V₃) were collected earlier from Pulses Research Centre experimental field in *rabi* seasons of 2003-04 considering three different times at 7-day intervals, viz. i) when the pods were yellowing with a few yellow greens (H₁ stage), ii) when most of the pods were light brown with a few yellow (H₂ stage), and iii) when all the pods were completely brown and dry (H₃ stage). The collected seeds were preserved in the earthen pot. Thousand-seed weight of BARI Chola-5, BARI Chola-6 and BARI Chola-8 were 120 g, 145 g, and 190 g, respectively. Before setting up the field experiment, laboratory experiment was carried out for recording the seed quality data (Khatun *et al.*, 2009).

Field experiments were conducted with the above seeds. The experiments were conducted in a factorial randomized completely block design. The row to row spacing was 30 cm and plant to plant 10 cm. The unit plot size was 3 m x 4 m. Seeds were sown on 17 November 2004 and 11 November 2005. Yield attributes and yield were recorded. The data for different characters were compiled and tabulated in proper form and then subjected to statistical analysis following a computer package programme IRRISTAT and mean differences were adjudged with Duncan's Multiple Range Test.

Results and Discussion

Pods/plant: Number of pods plant was directly related to seed yield. BARI Chola-5 produced higher pods/plant, which resulted in higher seed yield (Table 1), though number of pods/plant did not differ significantly among the varieties. Bhingarde and Dumbre (1993) reported that large sized seed gave higher number of pods/plant (21.9 pods) and smaller size seed gave lower pods/plant (20.5) in mungbean. Borate *et al.* (1993) observed that pods/plant was higher (19.2) in large size seeds and lower (12.9) in small size seed of groundnut. Harvesting stage showed significant difference in number of pods/plant only in 2005-06

where maximum pods were recorded from H₂ stage, which was similar to H₃ stage (Table 2). Interaction effects of variety and harvesting stage were significant in pods/plant where the highest number of pods/plant (40.3 in 2004-05 and 40.8 in 2005-06) was observed in H₃ stage of BARI Chola-5 and the lowest number of pods/plant was observed in V₃ x H₃ in both the years (Table 3).

seeds/pod: Number of seeds/pod significantly differed among the varieties in 2004-05 (Table 1). Bhingarde and Dumbre (1993) reported that large sized seed gave higher number of seeds/pod (8.1 seed) and smaller size seed gave lower seeds/pod (7.5 seed) in mungbean. The highest seeds/pod was observed in H₂ stage (Table 2). Variety x harvesting stage on seeds/pod was statistically identical (Table 3) though numerically the highest number of seeds/pod (1.77 in 2004-05 and 1.75 in 2005-06) was noted in V₁ x H₂.

Table 1. Effects of different varieties of chickpea on seed yield and its attributes.

Varieties	Pods/plant		Seeds/pod		1000-seed wt (g)		Seed yield (kg/ha)	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
BARI Chola-5	32.7	35.8	1.69a	1.67	130c	135c	1136a	1101a
BARI Chola-6	30.2	33.8	1.53b	1.61	153b	155b	958b	941b
BARI Chola-8	28.2	32.8	1.54b	1.53	192a	189a	832c	812c
SE (±)	-	-	0.4	-	3.44	2.55	35.4	17.5
Level of Sig.	ns	ns	*	ns	**	**	**	**

In a column, means values having common letters are not significantly different as per DMRT.

*significant at 5% level, **significant at 1% level, ns: Not significant.

1000-seed weight: Thousand-seed weight of three chickpea varieties differed significantly (Table 1). Maximum seed weight (192 g in 2004-05 and 189 g in 2005-06) was obtained in BARI Chola-8. Borate *et al.* (1993) observed that 1000-seed weight was higher (235 g) in large size seeds and lower (197 g) in small size seed of groundnut. Thousand-seed weight ranged from 110-120 g in BARI Chola-5, 140-150 g in BARI Chola-6, and 250-260 g in BARI Chola-8 was observed by Bakr *et al.* (2002). Harvesting stage did not show significant effect in 1000-seed weight (Table 2). The interaction effect of variety x harvesting stage was not significant in respect of 1000-seed weight (Table 3). This might be due to similar response of different varieties with harvesting stage. However, apparently thousand-seed weight was the highest in V₃ x H₂ (198 g in

2004-05 and 195 g in 2005-06) and it was the lowest in $V_1 \times H_1$ in 2004-05 and $V_1 \times H_2$ in 2005-06.

Table 2. Effects of chickpea seeds collected from different harvesting stages on seed yield and its attributes.

Harvesting stage	Pods/plant		Seeds/pod		1000-seed wt (g)		Seed yield (kg/ha)	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
H ₁	29.0	31.3b	1.49b	1.48b	156	156	881b	874
H ₂	31.6	36.4a	1.64a	1.68a	161	163	1079a	1081
H ₃	30.6	34.6ab	1.63a	1.65a	159	160	966ab	899
SE (\pm)	-	0.89	0.042	0.055	-	-	35.4	-
Level of Sig.	ns	**	*	*	ns	ns	**	ns

In a column, mean values having common letters are not significantly different as per DMRT.

*significant at 5% level, **Significant at 1% level, ns: Not significant.

Table 3. Interaction effects of chickpea varieties and seeds collected from different harvesting stages on seed yield and its attributes.

Interaction (V x H)	Pods/plant		Seeds/pod		1000-seed wt (g)		Seed yield (kg/ha)	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
V ₁ xH ₁	25.7 b	28.5 c	1.70	1.62	129	135	1073bc	1029 b
V ₁ xH ₂	32.0 ab	38.2 ab	1.77	1.75	130	132	1393a	1353 a
V ₁ xH ₃	40.3 a	40.8 a	1.60	1.65	131	137	942bcd	920 cd
V ₂ xH ₁	29.7 b	32.7 bc	1.37	1.43	152	150	859cde	883 d
V ₂ xH ₂	33.0 ab	35.5 abc	1.60	1.68	154	161	929bcd	959 bc
V ₂ xH ₃	28.0 b	33.1 b	1.63	1.73	153	153	1085b	980 bc
V ₃ xH ₁	31.7 b	32.8 bc	1.40	1.39	186	182	711e	709 f
V ₃ xH ₂	29.7 b	35.5 abc	1.57	1.62	198	195	916bcd	930 cd
V ₃ xH ₃	23.3 b	30.0 c	1.67	1.58	192	190	869cde	798 e
SE (\pm)	2.91	1.54	-	-	-	-	61.3	30.4
Level of Sig.	*	**	ns	ns	ns	ns	**	**
CV (%)	16.5	7.8	8.0	10.3	6.5	4.8	10.9	5.5

In a column, mean values having common letters are not significantly different as per DMRT.

*significant at 5% level, **Significant at 1% level, ns: Not significant.

Seed yield: Different varieties of chickpea varied significantly in terms of seed yield (Table 1). The highest seed yield (1136 kg/ha in 2004-05 and 1101 kg/ha in 2005-06) was recorded in BARI Chola-5. BARI Chola-5 produced the highest

Pods/plant, seeds/pod, which resulted in the highest seed yield. BARI Chola-6 recorded the second highest seed yield (958 kg/ha in 2004-05 and 941 kg/ha in 2005-06) and BARI Chola-8 gave the minimum yield (832 kg/ha in 2004-05 and 812 kg/ha in 2005-06). Harvesting stage increased significantly the seed yield of chickpea only in 2004-05 (Table 2). The highest seed yield was obtained in H₂ stage. The increase in yield in H₂ stage compared to H₁ was 22.5% in 2004-05 and 23.7% in 2005-06 which might be attributed to increased pods/plant, seeds/pod and 1000-seed weight (Rani and Kodandaramaiah, 1997; Bhuiyan, 2004). Mehta *et al.* (1993) conducted experiment with two chickpea varieties, namely H-75-35 and HK-88-232, and seeds were harvested at seven times (15, 22, 19, 33, 37, 41, 45 days after anthesis i.e., DAA). They observed that fresh weight of seed increased progressively upto 33 and 37 DAA in cvs. H-75-35 and HK-88-232, respectively, and subsequently fresh weight rapidly declined. They also reported that seeds harvested at 37 DAA recorded the highest dry weight of seeds when seeds collected at the stage when most pods were light brown with a few yellow green stages. The present findings are in agreement with the findings of Mehta *et al.* (1993). Mehta *et al.* (1993) also stated that all the cultivars attained maximum dry matter accumulation (physiological maturity) at H₂ stage thereafter, dry weight of seed decreased because of restricted supply of nutrients from mother plant to seed due to disruption of vascular connection and utilization in various physiological and metabolic processes like respiration etc. Interaction effect of varieties and harvesting stage was significant for seed yield (Table 3). BARI Chola-5 gave the highest seed yield at H₂ stage. BARI Chola-8 gave the lowest seed yield at H₁ stage.

The overall results revealed that the highest pods/plant, seeds/pod and seed yield were observed in BARI Chola-5 and the lowest in BARI Chola-8. Seeds collected at the stage when most of the pods were light brown with a few yellow (H₂ stage) recorded the highest pods/plant, seeds/pod, 1000-seed weight, and seed yield. BARI Chola-5 seeds collected at H₂ stage recorded the highest seed yield.

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