Reprint **ISSN 1991-3036 (Web Version)**

International Journal of Sustainable Crop Production (IJSCP)

(*Int. J. Sustain. Crop Prod.*)

Volume: 9	Issue: 2	August 2014

Int. J. Sustain. Crop Prod. 9(2): 17-21 (August 2014)

INFLUENCE OF SOWING DATE ON QUALITY SEED PRODUCTION OF BITTER GOURD

M.S. RAHMAN, M.N. ISLAM, M.R. SHAHEB, P.C. SARKER, A. NESSA AND M.H. SARKER

An International Scientific Research Publisher

Green Global Foundation©

Web address: http://ggfjournals.com/e-journals archive
E-mails: editor@ggfjournals.com and editor.int.correspondence@ggfjournals.com

ISSN-1991-3036 (Online)
Int. J. Sustain. Crop Prod. 9(2):17-21(August 2014)

INFLUENCE OF SOWING DATE ON QUALITY SEED PRODUCTION OF BITTER GOURD

M.S. RAHMAN[1a], M.N. ISLAM[1b], M.R. SHAHEB[2]*, P.C. SARKER[1c], A. NESSA[1d] AND M.H. SARKER[3]

[1a]Principal Scientific Officer, [1b]Scientific Officer (SO), [1c]Senior Scientific Officer (SSO) and [1d]Chief Scientific Officer & Head, Seed Technology Division, [3]SO, Farm Division, Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh;
[2]SSO, On-Farm Research Division, BARI, Sylhet, Bangladesh.

*Corresponding author & address: Md. Rayhan Shaheb, E-mail: smrayhan@bari.gov.bd
Accepted for publication on 10 July 2014

ABSTRACT

Rahman MS, Islam MN, Shaheb MR, Sarker PC, Nessa A, Sarker MH (2014) Influence of sowing date on quality seed production of bitter gourd. *Int. J. Sustain. Crop Prod.* 9(2), 17-21.

Bitter gourd is a vegetable grown for its edible fruit and also popular due to its medicinal properties. Though seeds are being used for propagation, thick seed coat and high seed deterioration rate are major problems associated low field germination. Sowing of seed at optimum time is important for quality seed production. Hence, a study was conducted at the field research farm of Seed Technology Division, Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh during September 2009 to May 2011 to select the optimum sowing date for quality seed production of bitter gourd and to find out a relationship between seed quality parameters and prevailing weather condition. Six different sowing dates *viz*., 1 October, 1 November, 1 December, 1 January, 1 February and 1 March were used in this study. Results revealed that there was significant difference on fruits plant^{-1}, seeds fruit^{-1}, 100 seed weight and seed yield ha^{-1}. Seed yield of bitter gourd increased gradually from 1 November sowing to 1 February sowing. This might be due to prevailing higher temperature at flowering stage. The highest seed yield (176.42 kg ha^{-1}) was obtained from 1 February sowing. This treatment also showed better seed quality in respect to seed germination (93.33%) and vigor index (10.66).

Key words: *sowing date, bitter gourd, seed yield, seed germination, vigour index*

INTRODUCTION

Bitter Gourd (*Momordica charantia* L.) belongs to Cucurbitaceae family, is one of the most popular vegetables in Bangladesh and also in other Asian countries namely China, Taiwan, Vietnam, Thailand, India and the Philippines. Bitter gourd has higher economic and dietic importance. Immature fruit is a good source of Vitamin C and also contains Vitamin A. Bitter gourd is a blood purifier, activates spleen and liver and is highly beneficial in diabetes (Yibchok *et al*. 2006). Studies have shown that bitter gourd has anti-carcinogenic properties and can be used as a cytotoxic agent against many types of cancer (Grover and Yadav, 2004). The average yield of bitter gourd is 14.53 t per hectare which seems to be low (BBS 2011). It is adapted to a wide range of environment and can be grown in tropical and subtropical climates (Lim 1998 and Reyes *et al*. 1994). Bitter gourd is a day neutral crop preferring warmer climate (Huda and Samiruddin, 1987). This crop can be grown round the year but the yield varies with the season (Rashid and Singh, 2000). The pick periods of cucurbitaceous vegetables cultivation usually less profitable due to availability of lot of vegetables at that time in the markets. Early or late availability of this vegetable can be much more profitable. The growing season is mainly determined by the rainfall and temperature. Summer season is preferred over rainy season for raising seed crops because they have thick seed coat, seeds do not dry properly in humid weather (Seshadri 1986). In our country bitter gourd is grown round the year. For seed production, farmers usually grow this crop in summer season when the prevailing climate is not congenial for seed production of most of the summer vegetables including bitter gourd. As a result, seeds of bitter gourd do not meet the proper seed quality parameters and farmers do not get healthy plants from these seeds. Thus, production cost is increased and yield is decreased mainly due to the result of such poor quality seed. But for seed production, this crop can be grown in winter so that seeds can be collected before monsoon. Seed yield of bitter gourd is influenced by many factors like sowing date, plant spacing, number of fruits per plant etc. Seed quality has been described as a multiple concept comprising several components (de Geus *et al*. 2008). Hampton (2002) described seed quality as the standard of excellence in certain characteristics that will determine performance when the seed is either stored or sown. Seed germination capacity and vigor are, therefore, the key measures of seed quality (Bewley 1997; ISTA 2003). Sowing dates had significant effect on seed yield, the highest seed yield (551 g plot^{-1}) was obtained when seeds were sown on March 23 which was 155.44% higher than the lowest seed yield produced by sowing on April 22 (216 g plot^{-1}) and the optimum sowing date is late February to late March (Rukui Huang *et al.* 2010) The literature on quality seed production of bitter gourd is inadequate in our country. Hence, the present study was under taken i) to select the appropriate sowing date for quality seed production of bitter gourd, and ii) to find out a relationship between seed quality parameters and prevailing weather parameters.

MATERIALS AND METHODS

The experiment was conducted at the field laboratory of Seed Technology Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur, Bangladesh during September 2009 to May 2011. The experiment was carried out in randomized complete block design with 4 replications. The treatments were six (6) sowing dates *viz.*, 1 October, 1 November, 1 December, 01 January, 1 February and 1 March. Each bed was 4.0 m long having 2.0 m width. Plant to plant spacing was maintained 1.0m × 1.0 m comprising 8 plants per bed. One plant

was maintained in each pit. Bamboo made trellis with net rope was provided for creeping of the plants. NPKSBZn @ 70-30-50-20-1-5 kg ha^{-1} was applied along with cowdung @ 10 t ha^{-1}. The full amount of cowdung, P, K, S, and $^1/_3$ of N were applied during final pit preparation. The remaining amount of N was top dressed in two equal splits at 25-30 and 45-60 days after planting. The variety of bitter gourd was BARI Karola-1. Weeding, irrigation and plant protection measures were done as and when necessary. Data on fruits $plant^{-1}$, seeds $fruit^{-1}$, 100 seeds weight and seed yield ha^{-1} etc. were recorded and analyzed statistically with the help of MSTAT-C. Treatment means were compared following Least Significant Difference (Gomez and Gomez, 1984). Seed germination and vigor index were calculated on the basis of the following formula:

$$\text{i) Seed germination (\%)} = \frac{\text{No. of seed germinated}}{\text{Total seed}} \times 100 \quad \text{.....(A)}$$

$$\text{ii) Vigor index (VI)} = \text{ASDW x PG} \quad \text{.....(B)}$$

Where,
VI = Vigor index;
ASDW= Average seedling dry weight;
PG = Percentage germination.

RESULTS AND DISCUSSION

Seed yield and yield contributing characters

Sowing date showed significant difference on fruits per plant, seeds per fruit, 100s seed weight and seed yield of bitter gourd (Table 1). Maximum (15.56) fruits per plant were observed in 1 February sowing which was statistically similar with 1 March and 1 January sowing. This might be due to prevailing higher temperature at flowering stage. But minimum (7.15) fruits per plant were observed in 1 November sowing which was statistically at par with 1 December sowing. Lower temperature during crop growth period might be the reason of lower number of fruits per plant at early sowings. Seeds per fruit was found maximum (9.12) in 1 March sowing. This was not statistically varied with sowing of seeds at 1 February, 1 January and 1 December. But minimum (7.35) seeds per fruit were observed in 1 October sowing which was statistically similar with 1 November and 1 December sowing. The highest (17.60 g) 100 seeds weight was found in 1 March sowing which was statistically similar with 1 February sowing. But the lowest (12.98 g) 100 seeds weight was found in 1 November sowing which was statistically not varied with 1 October sowing. Seed yield per hectare was found the highest (176.65 kg) in 1 February sowing and it was statistically similar with 1 March sowing. The result is in agreement with Joshi and Srivastava (2002) reported that the highest numbers of fruits per plant and fruit yield of bitter gourd were obtained with transplanting on 29 January and direct sowing on 12 March and the average fruit weight was also higher with transplanting on 12-16 February and direct sowing on 26 February. The lowest (53.87 kg ha^{-1}) seed yield was observed in 1 November sowing. After 1 November sowing there was a trend of gradual increasing of seed yield with the later sowings up to 1 February sowing and thereafter declined. Increasing of seed yield after 1 November sowing might be due to rising of air temperature. But declining of seed yield after 1 March might be due to rain which disturbed in pollination. The results are in agreement with the findings of Gogi *et al.* (2014) who reported that early sowing (15 February) with plant-to-plant distance of 45 cm and sanitation practice can be recommended for integration with other IPM practices against melon fruit fly and the highest seed yield of bitter gourd in cucurbit cropping system.

Rukui Huang *et al*. (2010) suggested that sowing date had significant effects on seed yield of bitter gourd and they also reported that the highest seed yield of bitter gourd was obtained when seeds were sown on March 23, which was 155.44% higher than the lowest seed yield produced by sowing on April 22. These results suggest the optimum sowing date late February to late March are optimum for seed production of bitter gourd in spring season.

Seed quality parameters

Results indicated that sowing date showed significant influence of seed germination percentage and seedling vigor of bitter gourd. Seed germination percentage was found maximum (93.33%) in 1 February sowing might be due to its higher 100 seeds weight and congenial weather during seed harvest and drying. The minimum seed germination percentage (83.33%) was observed in 1 November sowing and this was statistically similar with 1 October and 1 December sowing might be due to lower 100 seeds weight. The maximum vigor index (10.66) was observed in 1 February sowing and this was statistically at par with 1 January sowing. Higher vigor index might be due to higher seed germination percentage and individual seedling dry weight bitter gourd. The lowest vigor index was observed in 1 November sowing and it was statistically similar with 1 December and 1 October sowing.

Table 1. Seed yield and yield contributing characters of bitter gourd as influenced by sowing dates

Sowing date	Fruits plant^{-1} (nos.)	Seeds fruit^{-1} (nos.)	100 seeds weight (g)	Seed yield (Kg ha^{-1})
01 October	10.35b	7.35c	13.20c	77.05c
01 November	7.15c	7.86bc	12.98c	53.87d
01 December	8.25bc	8.15abc	15.95b	74.60c
01 January	13.15a	8.51ab	16.45b	133.67b
01 February	15.56a	8.96ab	17.40a	176.65a
01 March	15.05a	9.12a	17.60a	174.73a
CV (%)	12.07	7.30	2.27	9.49
LSD $_{0.05}$	2.544	1.105	0.643	19.76

Table 2. Seed quality characters of bitter gourd as influenced by sowing dates

Sowing date	Germination (%)	Vigor Index
01 October	83.33c	7.62cd
01 November	81.67c	6.99d
01 December	83.33c	7.04d
01 January	88.33b	8.85b
01 February	93.33a	10.66a
01 March	76.67d	7.96c
CV (%)	2.93	5.42
LSD $_{0.05}$	3.11	0.82

Relationships between seed yield and prevailing weather

The maximum, minimum and average air temperatures gradually decreased from October to up to next January. After that it was reversed i.e., air temperature gradually increased. Bitter gourd is a summer crop. For its better growth and development air temperature must be more than 25^{o}C and below 20^{o}C, growth and development of this crop hampered. In 1 October sowing, early vegetative growth was satisfactory, but after that crop growth was reduced due to lower temperature. This situation was also applicable for 1 November sowing. Plants of 1 December and 1 January sowings faced lower temperature at vegetative stage but got higher temperature at seed development stage. Plants of 1 February and 1 March sowings got more or less optimum temperature throughout the whole growing period except a very few days during seedling. But plants of 1 March sowing usually face rains during seed development stage. For this, flower pollination and seed drying were hampered. Ultimately seed yield and quality decreased. The results are in agreement with the findings of Castillo *et al.* (1994) who reported that the environment during seed development is a major determinant of seed quality, particularly seed vigor.

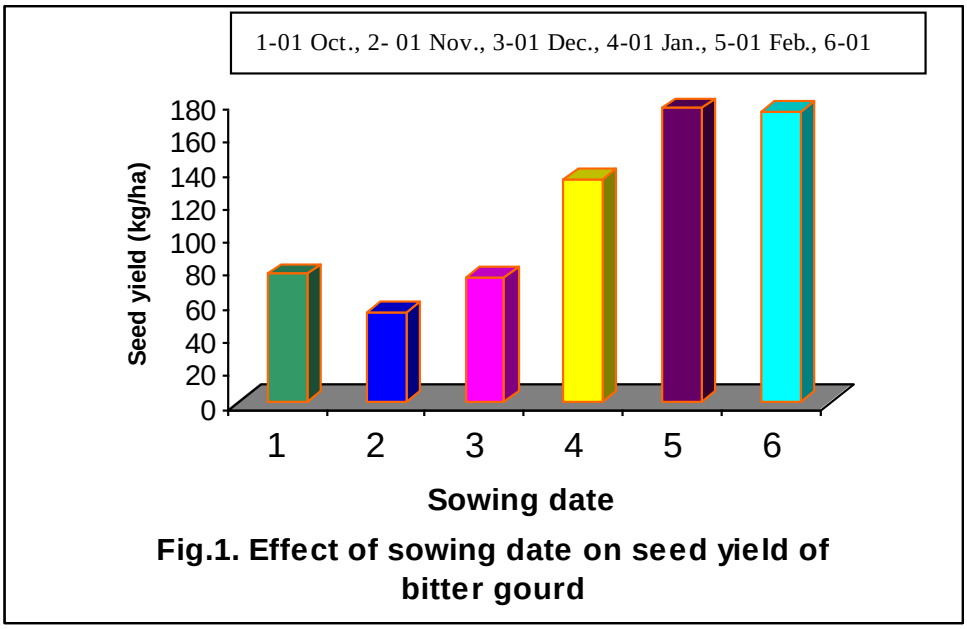

Fig.1. Effect of sowing date on seed yield of bitter gourd

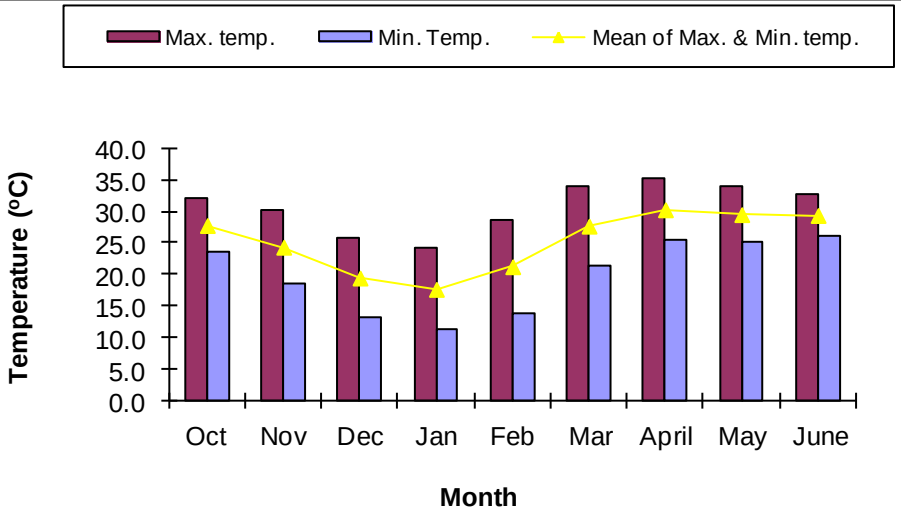

Fig. 2. Monthly mean maximum and minimum temperature during growing period of bitter gourd

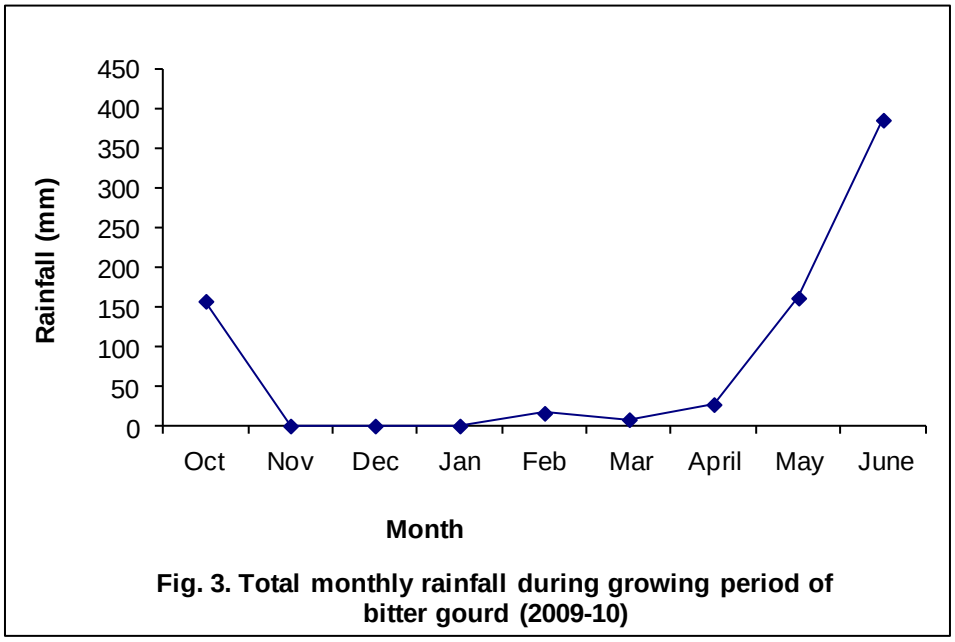

Fig. 3. Total monthly rainfall during growing period of bitter gourd (2009-10)

CONCLUSION

The study concluded that 1 February sowing recorded the maximum seed yield and quality characters and it was on pared with 1 March sowing. The environmental condition prevailed during this month enhanced the growth and yield parameters. Hence for bitter gourd, 1 February or 1 March is the suitable for seed production with maximum seed quality.

REFERENCES

BBS (2011) Yearbook of Agricultural Statistics in Bangladesh. *Bangladesh Bureau of Statistics.* Ministry of Planning. Government of People's Republic of Bangladesh, Dhaka, p.39.

Bewley JD (1997) Seed germination and dormancy. *Plant Cell.* 9, 1055–1066.

Castillo AG, Hampton JG, Coolbear P (1994) Effect of sowing date and harvest timing on seed vigour in garden pea (*Pisum sativum* L.). *New Zealand J. Hort. Sci.* 22, 91-95.

de Geus YN, Goggi AS, Pollak L (2008) Seed quality of high protein corn in organic and conventional farming systems. *Agron Sustainable Develop*. (formerly agronomie). 28(4), 541-550.

Gogi MD, Arif MJ, Arshad M, Khan MA, Bashir MH, Zia K, Abdin ZU (2014) Impact of Sowing Times, Plant-to-Plant Distances, Sowing Methods and Sanitation on Infestation of Melon Fruit Fly (*Bactrocera cucurbitae*) and Yield Components of Bitter Gourd (*Momordica charantia*). *Int. J. Agric. Biol*. 16(3), 521-528.

Gomez KA, Gomez AA (1984) Statistical procedures for Agricultural Research. 2nd edn. John Wiley and Sons, New York, p.194.

Grover JK, Yadav SP (2004) Pharmacological actions and potential uses of Momordica charantia-A review. *J. Ethnopharmacol*. 93, 123-132.

Hampton N (2002) What is Seed Quality? *Seed Sci. and Technol.* 30, 1-10.

Huda MN, Samiruddin M (1987) Vegetable Seed Technology in Bangladesh. 1st Publ. BADC, Dhaka, p.282.

ISTA (2003) International Seed Testing Association, ISTA Handbook on Seedling Evaluation. 3rd edn. Bassersdorf, Switzerland.

Joshi NC, Srivastava BK (2002) Performance of bittergourd raised through transplanting of polyhouse grown seedlings and direct seeding on different dates. *J. Appl. Hort*. 4(2), 90-92.

Lim VT (1998) Economics of Farm production and management, Kalayni publishers, Ludhiana, pp.128-132.

Rashid MA, Singh DP (2000) A manual on vegetable seed production in Bangladesh. AVRDC-USAID Bangladesh Project, HRC. BARI. Joydebpur, Gazipur-1701. Bangladesh, p.98.

Reyes TB, Dickson A, Hosner JE (1994) Quality appraisal of bitter melon. *Forestry Chronicle*. 36, 10-14.

Rukui Huang, Fengxue Fang, Fusheng Zhuang, Hongwei Kang, Yuhui Huang, Hailing Lou (2010) Sowing date, plant density, fruits per plant and harvest time influenced yield and quality of hybrid seed of bitter gourd (*Momordica charantia*). *Acta Hort.* (ISHS). 871, 395-402, http://www.actahort.org/books/871/871_54.htm.

Seshadri VS (1986) Cucurbits. In: Vegetable crops in India, edited by T. K. Bose and M. G. Som Naya Prokash, Calcutta, India, pp.91-166.

Yibchok AS, Adisakwattana S, Yao CY, Sangvanich P, Roengsumran S, Hsu WH (2006) Slow acting protein extract from fruit pulp of *Momordica charantia* with insulin mimetic activities. *Biol. Pharm. Bull.* 29, 1126-1131.