



Performance of chilli (*Capsicum annuum*) genotypes under *terai* agroclimatic region of West Bengal*

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Chilli (*Capsicum annuum* L.) is one of the most important vegetable-cum-spice crops grown in India and world too. In India, it is cultivated in an area of about 9.15 lakh ha (Kallapurackal and Ravindran 2004) and exports only 2.75 to 7.50% of its total production. West Bengal contributes 6% in terms of Indian chilli production. During 2006–07, India earned about a tune of ₹ 807.75 crores by exporting chilli and chilli products, which contributed to the 22.59% value in terms of total spice export (Anonymous 2007). In West Bengal it is cultivated in an area of about 65 930 ha with a production of about 643 677 tones. Productivity of this crop is low (0.98 tonnes/ha) as compared to national level (1.12 tonnes/ha). It is an important cash crop in the northern parts of West Bengal. In this region most of the chilli farmers grow local cultivars both in winter (*rabi*) and rainy (*kharif*) season. No such record is available about the performance of the different genotypes of chilli, particularly in the northern parts of the West Bengal. Because most of the experiment was carried out in the southern parts of the West Bengal and soil and climatic condition is different from northern parts of the West Bengal. The differential response of genotypes when grown under different environments with same season has been also reported by Lohithaswa *et al.* (2000) and under different growing season by Mini and Vahab (2000). Keeping in view the present investigation was undertaken under *terai* agro climatic condition of West Bengal to study the performance of the selected green chilli genotypes in *kharif* and *rabi* season

An experiment was conducted to study the performance of the selected green chilli genotypes in two different seasons at the experimental farm (26°19'86" N latitude and 89°23'53" E longitude) of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal. The experimental soil was sandy clay loam having pH 5.5, 0.91% organic carbon,

133.81 kg/ha available nitrogen, 45.62 kg/ha available phosphorus and 59.43 kg/ha potash. The climatic condition of this region is sub-tropical humid in nature. The experiment was laid out in factorial randomized block design with three replications. Fifteen chili genotypes (five genotypes each from local genotypes, viz 'CA 29', 'CA 30', 'CA 39', 'CA 47' and 'CA 48', improved varieties, viz 'Chilli Philhal', 'Pusa Sadabahar', 'DKC 8', 'Pusa Jwala' and 'G 4' and hybrids, viz 'Diamond F₁', 'Tejaswini', 'NS 1701', 'Jwala', and 'Ulka 686 F₁') were transplanted in the *rabi* and *kharif* season in two consecutive years (2005–06 and 2006–07). Healthy and uniform seedlings were transplanted in plots of 3.60 m×3.0 m size with a spacing of 30 cm×45 cm during middle of November and third week of April for *rabi* and *kharif* season, respectively. The crops were grown with standard package of practices as suggested by Anonymous (2003). Observation on different morphological and yield-attributing characters were recorded from 10 randomly selected plants for each replications. Ascorbic acid in green chilli was determined by colorimetric method as described by Ranganna (2001). Capsaicin content (%) of green fruits is measured by Spectrophotometer method as described by Sadasivam and Manickam (1996). Leaf chlorophyll content was measured by with the help of Chlorophyll Meter (Made of Konica Minolta Sensing, INC, Japan) with the unit of SPAD-502 at the time of first harvest. The Indostat package was used for analyzing the experimental data.

Mean performance revealed that plant height, primary branches/plant, days to first flower, leaf chlorophyll content, fruit length, individual fruit weight, yield and capsaicin content in red fruit varied significantly with respect to season and maximum magnitude was recorded in *rabi* season (Table 1). In *rabi* season crop the moderate temperature range might have helped plant to accumulate more photosynthetates which in turn produce a good number of fruits and fruit yield. This result is in confirmation with the reports by Mini and Vahab (2000) in chilli. Ascorbic acid did not vary significantly with respect to season. Irrespective of season the maximum plant

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Table 1 Effect of planting season and variety on growth, yield parameters and yield in chilli

| Season | Plant height (cm) | Primary branches/plant | Days taken to 50% flowering | Fruit length (cm) | Fruit diameter (cm) | Individual fruit weight (g) | Leaf chlorophyll content (SPAD-502) | Pericarp (%) | Seed (%) | Stalk (%) | Ascorbic acid (mg/100 g green fruit) | Capsaicin content in green chilli (%) | Fruit number | Fresh green fruit yield (tonnes/ha) |
|--|-------------------|------------------------|-----------------------------|-------------------|---------------------|-----------------------------|-------------------------------------|--------------|----------|-----------|--------------------------------------|---------------------------------------|--------------|-------------------------------------|
| <i>Rabi</i> (S ₁) | 63.53 | 7.29 | 60.24 | 6.42 | 1.01 | 2.45 | 61.07 | 49.93 | 42.17 | 7.90 | 127.84 | 0.59 | 139.79 | 12.17 |
| <i>Kharif</i> (S ₂) | 60.49 | 5.97 | 59.15 | 6.24 | 0.97 | 2.33 | 49.85 | 46.12 | 45.90 | 7.98 | 127.45 | 0.58 | 88.93 | 6.86 |
| SEM (±) | 0.32 | 0.03 | 0.32 | 0.02 | 0.01 | 0.01 | 0.27 | 0.21 | 0.21 | 0.08 | 0.38 | 0.002 | 0.61 | 0.06 |
| C D (<i>P</i> = 0.05) | 0.98 | 0.10 | NS | 0.06 | 0.02 | 0.02 | 0.77 | 0.60 | 0.60 | NS | NS | 0.006 | 1.71 | 0.18 |
| <i>Genotypes</i> | | | | | | | | | | | | | | |
| 'CA 29' (V ₁) | 53.24 | 7.73 | 39.34 | 5.90 | 1.08 | 2.79 | 59.97 | 47.18 | 44.10 | 8.72 | 142.29 | 0.53 | 140.59 | 12.21 |
| 'CA 30' (V ₂) | 62.06 | 6.90 | 44.59 | 5.95 | 1.08 | 2.02 | 58.23 | 41.57 | 50.01 | 8.42 | 133.83 | 0.36 | 104.99 | 8.97 |
| 'CA 39' (V ₃) | 60.17 | 5.93 | 51.34 | 5.01 | 1.07 | 2.28 | 60.60 | 47.29 | 44.97 | 7.74 | 136.22 | 0.48 | 96.27 | 8.36 |
| 'CA 47' (V ₄) | 64.80 | 6.49 | 50.92 | 5.93 | 1.18 | 2.31 | 49.75 | 43.45 | 49.35 | 7.20 | 126.70 | 0.33 | 111.14 | 9.62 |
| 'CA 48' (V ₅) | 49.57 | 6.35 | 54.75 | 5.68 | 1.14 | 2.22 | 51.25 | 40.23 | 51.09 | 7.68 | 117.44 | 0.61 | 109.49 | 9.44 |
| 'DKC 8' (V ₆) | 59.48 | 6.31 | 67.25 | 5.84 | 1.01 | 2.08 | 54.55 | 46.69 | 45.53 | 7.78 | 126.24 | 0.37 | 107.19 | 7.92 |
| 'Pusa Sadabahar' (V ₇) | 63.95 | 6.76 | 62.50 | 6.30 | 1.02 | 2.30 | 59.84 | 46.29 | 46.52 | 7.19 | 143.97 | 0.48 | 123.59 | 9.67 |
| 'Chilli Phihal' (V ₈) | 57.37 | 5.46 | 63.42 | 5.10 | 1.01 | 1.69 | 49.63 | 45.81 | 46.10 | 8.09 | 122.74 | 0.57 | 93.82 | 6.93 |
| 'Pusa Jwala' (V ₉) | 52.10 | 5.63 | 62.92 | 7.90 | 0.94 | 2.37 | 53.27 | 50.48 | 40.38 | 9.14 | 135.55 | 0.54 | 80.25 | 5.89 |
| 'G 4' (V ₁₀) | 76.30 | 5.99 | 74.08 | 6.75 | 0.78 | 2.28 | 51.33 | 55.96 | 36.68 | 7.36 | 145.05 | 0.84 | 76.94 | 5.84 |
| 'Diamond F ₁ ' (V ₁₁) | 52.87 | 6.95 | 59.75 | 7.65 | 0.87 | 2.79 | 52.37 | 52.43 | 40.19 | 7.38 | 139.02 | 0.46 | 91.65 | 8.38 |
| 'Tejaswini' (V ₁₂) | 90.31 | 6.79 | 68.00 | 6.80 | 0.78 | 2.23 | 59.03 | 46.28 | 46.08 | 7.64 | 104.68 | 0.94 | 126.69 | 10.02 |
| 'NS 1701' (V ₁₃) | 53.54 | 6.57 | 67.84 | 8.97 | 1.12 | 3.35 | 58.13 | 57.05 | 35.14 | 7.81 | 98.00 | 0.69 | 100.12 | 8.79 |
| 'Jwalan' (V ₁₄) | 58.66 | 7.29 | 61.92 | 4.83 | 0.86 | 1.90 | 52.64 | 48.13 | 43.70 | 8.17 | 132.30 | 0.71 | 172.74 | 14.16 |
| 'Ulka 686' F ₁ (V ₁₅) | 75.29 | 7.80 | 63.75 | 6.39 | 0.91 | 3.25 | 61.32 | 51.54 | 40.70 | 7.16 | 110.93 | 0.82 | 179.93 | 16.14 |
| SEM (±) | 0.45 | 0.05 | 0.62 | 0.04 | 0.02 | 0.01 | 0.75 | 0.59 | 0.58 | 0.23 | 0.54 | 0.003 | 1.18 | 0.12 |
| C D (<i>P</i> = 0.05) | 1.25 | 0.14 | 1.75 | 0.12 | 0.05 | 0.04 | 2.10 | 1.64 | 1.64 | 0.65 | 1.52 | 0.010 | 3.32 | 0.34 |
| <i>Interaction</i> | | | | | | | | | | | | | | |
| SEM (±) | 1.23 | 0.13 | 0.88 | 0.06 | 0.03 | 0.02 | 1.50 | 1.17 | 1.16 | 0.47 | 1.48 | 0.010 | 1.67 | 0.17 |
| C D (<i>P</i> = 0.05) | 3.43 | 0.37 | 2.47 | 0.17 | 0.09 | 0.05 | 4.20 | 3.28 | 3.27 | NS | NS | 0.025 | 4.67 | 0.47 |

height was recorded in 'Tejaswini', followed by 'G 4' and 'Ulka 686 F₁' and it was lowest in 'CA 48'. Similar observation was also reported by Suseela and Bharartalakshmi (2005), Kameswari *et al.* (2006) and Khurana *et al.* (2003). The highest number of primary branches/plant was recorded in 'Ulka 686 F₁' which was also statistically at par with 'CA 29'. Choudhary and Samadia (2004) also observed that mean number of branches/plant varied from 4.77 to 10.65, which was close proximity with the present experiment. Days to flowering and first harvest varied from 39.34 to 74.08 days and 74.25 to 137.25 days, respectively. Highest leaf chlorophyll content was recorded in 'Ulka 686 F₁', 'CA 39', 'CA 29', and 'Pusa Sadabahar', whereas the was lowest in 'Chilli Philhal' 'CA 47', 'CA 48' and 'G 4'.

Significantly highest fruit length and individual fruit weight was recorded in 'NS 1701' (8.97 cm) and lowest fruit length was recorded in 'Jwalan' (4.83 cm) which was statistically *at par* with 'CA 39' and lowest fruit weight in 'Chilli Philhal', followed by 'Jwalan'. Prasad *et al.* (2003) reported fruit length ranged from 3.00 cm to 9.00 cm. In an experiment Muthukrishnan *et al.* (2002) recorded highest fruit length in 'Pusa Jwala' (8.0 cm) which was more or less similar with the finding of the present experiment. Among the different genotype the higher pericarp percentage was recorded in 'NS 1701' followed by 'G 4' and 'Diamond F₁' and lower in 'CA 48', followed by 'CA 30' and 'CA 47'. The reverse trend was observed between pericarp and seed percentage.

The highest number of fruit/plant was recorded in 'Ulka 686 F₁' (179.93) followed by 'Jwalan' (172.74), 'CA-29' (140.59), etc. and it was minimum in 'G 4' (76.94). Jose and Khader (2002) observed that fruits per plant varied from 51 to 397. Khurana *et al.* (2003) reported that number of fruits/plant varied from 7.33 to 222.22. The difference among the findings might be due to environmental variation and genetic expression of genotypes. Similarly, the fruit number and highest yield was also recorded in 'Ulka 686 F₁' (16.14 tonnes/ha) followed by 'Jwalan' (14.16 tonnes/ha), 'CA 29' (12.21 tonnes/ha) and lowest in 'G 4' (5.84 tonnes/ha) which was also statistically at par with 'Pusa Jwala'. Hundal and Khurana (1988) reported that fruit yield in condition varied from 0.23 to 33.52 tonnes/ha in chilli varieties and hybrids.

Among the genotypes ascorbic acid content varied from 98.00 to 145.05 mg/100 g. The findings of the present experiment corroborated with the findings of Kumar *et al.* 2003. Significantly the highest capsaicin content in green fruit was recorded in 'Tejaswini' followed by 'G 4' and lowest in 'CA 47'. This result is in confirmation with the findings of Bajaj *et al.* (1978).

With respect to interaction effect it was evident that the plant height varied from 47.30 to 95.94 cm. In the *rabi* season 'Ulka 686 F₁', 'CA 29', 'Jwalan' and 'CA 30' produced higher number of primary branches per plant. As

a result these genotypes produced higher number of fruits per plants in *rabi* season. In *rabi* season, significantly highest number of fruit was observed in 'Ulka 686 F₁', followed by 'Jwalan', 'CA 29', 'CA 47' and 'CA 30'. The higher fruit yield in *rabi* season was recorded in 'Ulka 686 F₁' (21.00 tonnes/ha) followed by 'Jwalan' (16.23 tonnes/ha), 'CA 29' (15.50 tonnes per ha), 'CA 47' (14.40 tonnes/ha) and 'CA 30' (13.60 tonnes/ha) and 'CA 48' (13.37 tonnes/ha), whereas, significantly lowest yield in *rabi* season was recorded in Pusa Jwala (7.30 tonnes/ha). In the *kharif* season significantly the highest yield was recorded in Jwalan (12.08 tonnes/ha) followed by 'Ulka 686 F₁' (11.27 tonnes/ha), 'Pusa Sadabahar' (9.53 tonnes/ha), 'Tejaswini' (8.95 tonnes/ha) and 'CA 29' (8.86 tonnes/ha) and lowest in 'G 4' (3.62 tonnes/ha). Ascorbic acid content among the genotypes varied from 95.09 mg/100 g in *Kharif* season grown 'NS 1701' to 146.27 mg/100 g in *kharif* grown 'Pusa Jwala' whereas capsaicin content in green fruit varied from 0.32% in *kharif* grown 'CA 47' to 0.96% in *rabi* season grown 'Tejaswini'.

It was evident that the higher fruit yield in the *rabi* season was recorded in 'Ulka 686 F₁' followed by 'Jwalan' and 'CA 29'. In *kharif* season significantly the highest yield was recorded in 'Jwalan', followed by 'Ulka 686 F₁' and 'Pusa Sadabahar'. So, these varies may be taken into consideration for cultivation of chilli in the terai zone of West Bengal.

SUMMARY

An experiment was conducted to study the performance of fifteen chilli genotypes in winter (*rabi*) and rainy (*kharif*) seasons at the Experimental Farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal during 2005–06 and 2006–07. The experiment was laid out in factorial randomized block design with three replications. Mean performance revealed significant variation in growth, yield and quality characters (except Vitamin C) among the genotypes and growing seasons. In *rabi* season, the highest number of fruits and fruit yield was observed in 'Ulka 686 F₁' (232.24 and 21.00 tonnes/ha, respectively) as compared to 'Jwalan' (206.53 and 16.23 tonnes/ha, respectively) and 'CA 29' (174.63 and 15.50 tonnes/ha, respectively). Similarly, in *kharif* season, the highest fruit yield was recorded in 'Jwalan' (12.08 tonnes/ha) followed by 'Ulka 686 F₁' (11.27 tonnes/ha) and 'Pusa Sadabahar' (9.53 tonnes/ha). The ascorbic acid content varied from 95.09 mg/100 g to 146.27 mg/100 g in *kharif* grown 'NS 1701' and 'Pusa Jwala', respectively, whereas, capsaicin content in green fruit varied from 0.32% in *kharif* grown 'CA 47' to 0.96% in *rabi* season grown 'Tejaswini'. It is evident that the genotypes 'Ulka 686 F₁', 'Jwalan', 'CA 29' and 'CA 47' could be chosen for cultivation in *rabi* season and genotypes 'Jwalan', 'Ulka 686 F₁', 'Pusa Sadabahar', 'Tejaswini' and 'CA 29' for *kharif* season for the commercial production under terai zone of West Bengal.

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