

ON-FARM YIELD PERFORMANCE OF IMPROVED VARIETIES OF VEGETABLES IN SYLHET REGION

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ABSTRACT

A total of five separate field trials were conducted at farm farmers' field in Sylhet area during three consecutive crops seasons of 2014-15, 2015-16 and 2016-17, respectively to evaluate the yield performance of improved varieties with the existing cultivars of five vegetables at farmers' field. Each experiment was laid out in randomized complete block design with six dispersed replications. The unit plot size was 5m x 8m. The results showed that improved variety of tomato (var. BARI Tomato-14) produced higher average fruit (55.60 t ha^{-1}) yield with the yield increase of 16.93% over control. In case of country bean, the local variety Golangadda performed better and produced higher green pod yield (14.31 t ha^{-1}) compared to that of BARI Sheem-6. The brinjal variety BARI Bt Begun-2 was the best yielder with an average fruit yield of 25.62 t ha^{-1} i.e. 107.62% increase over non-Bt as check. In case of yield trial with Capsicum, locally grown cultivar California Wonder performed better and produced comparatively higher yield (14.02 t ha^{-1}) than var. BARI Mistimorich-1. In case of summer hyacinth bean viz., BARI Sheem-7 gave higher pod yield of 14.96 t ha^{-1} compared to that of the check variety (11.41 t ha^{-1}) in researcher-managed trial.

Keywords: Country bean, summer hyacinth bean, capsicum, tomato, Bt begun, acidic soil

INTRODUCTION

Bangladesh has considerable potential for growing horticultural crops (Shahabuddin and Dorosh, 2002, Alam, 2005). The Sylhet region is mostly under the agro-ecological zone 20 (Eastern Surma Kushiya Floodplain) and the soils of this region are strongly acidic (pH 4.5-5.5). The climate of this region is suitable for potato, tomato, cabbage, aroids and other vegetable production (Nazrul and Shaheb, 2014, Nazrul et al., 2013, Nazrul et al., 2013, Shaheb et al., 2012, Sarker, et al., 2012). In addition, agriculture is the only economic activity of most small farmers in this region. The region produces vegetables not sufficient enough to fulfill the local demand over the

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year. As a result, the price of vegetable is always higher in the market and the demand is fulfilled through the supply from other parts of the country. Vegetable growers often earn higher incomes than those of cereal crops alone. But improved production technologies such as high yielding varieties and improved cultivation practices are not available to the farmers in right time. Many new vegetable varieties are now available to the growers from different sources. But performance of those varieties with improved management practices is not available to the farmers for cultivation under different soil and climatic conditions of the country. Therefore, for creation of awareness among the vegetable farmers about the high yielding varieties along with their production technologies on-farm trial is necessary. Hence, field trials were conducted with objective to evaluate the yield performance of improved varieties of five vegetables with their existing cultivars at farmers' field in Sylhet region.

MATERIALS AND METHODS

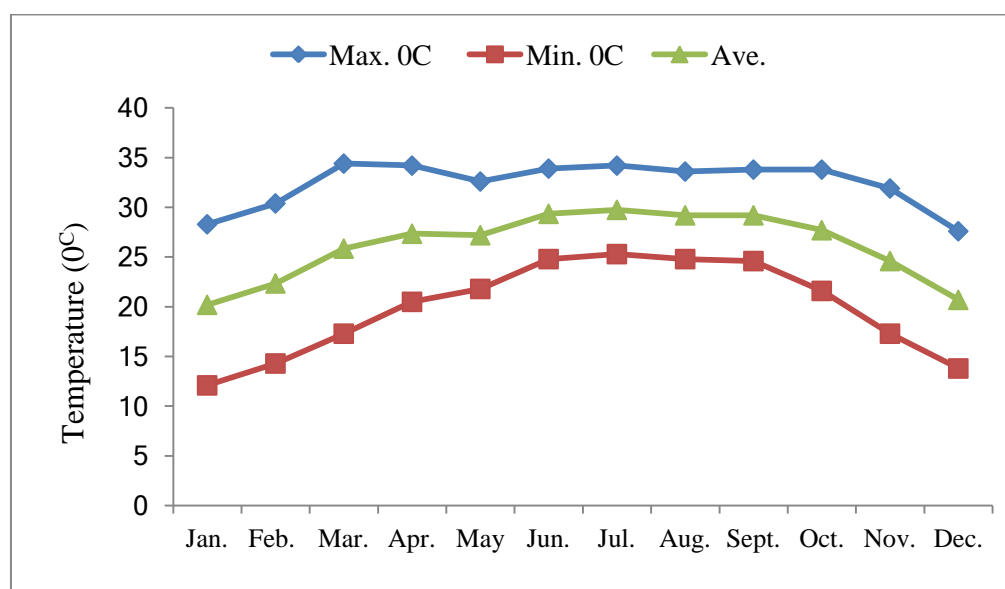
A total of five separate field trials were conducted at farmers' field in Sylhet area for the three consecutive crops seasons of 201-15, 2015-16 and 2016-17 to evaluate the yield performance of improved varieties with the existing cultivars of five vegetables. The study area lies at 24⁰70' N latitude and 91⁰67' E longitude under the Surma-Kushiyara Floodplain of Bangladesh. The soil of experimental plots was non-calcareous gray with low organic matter content (1.23%), low soil pH (4.5-5.3), very low total N (0.06%), low content of P (9.46), K (0.13) and S (10.07) where as Zn (1.13) and Boron (0.51) medium and optimum; respectively (Table 1). Each experiment was laid out in randomized complete block design with six dispersed replications. The unit plot size was 5m x 8m.

The monthly average, maximum and minimum temperature of the experimental site are indicated in figure 1. The climatic data of Sylhet shows that the mean annual minimum temperature is 11.55⁰C and the mean annual maximum temperature is 34.23⁰C and the annual mean temperature nearly is 17.54⁰C.

As indicated in figure 2, rainfall of the area is uni-modal, usually occurring during April to October, and total annual rainfall reached to 4217 mm; whereas in December no rain at all and the lowest amount of rainfall occurred in January followed by February. However, during rest of the months, total rainfall was ranged from 100 to just below 800 mm. Rainfall increased gradually from the month of May and continued up to September.

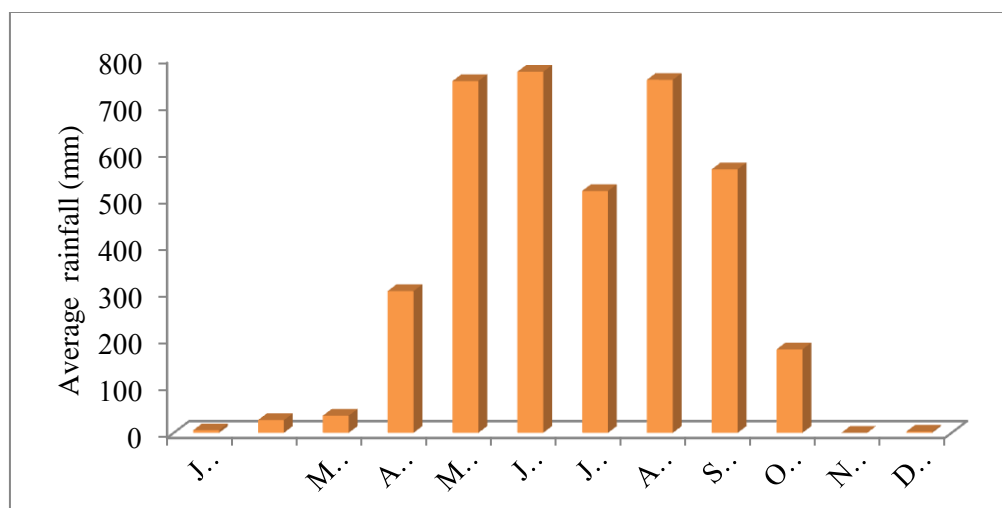
Table 1. Chemical properties of experimental soil

Replications	pH	OM (%)	Total N (%)	K	P	S	Zn	B
				meq/100g soil	µg/g soil			
1	5.40	1.56	0.07	0.11	2.46	10.80	1.24	0.33
2	4.50	1.07	0.05	0.12	12.53	12.31	1.11	0.51
3	5.53	0.98	0.06	0.16	11.32	8.31	1.00	0.56
4	5.51	1.26	0.06	0.11	11.99	8.31	1.15	0.54
5	4.70	1.21	0.07	0.14	9.87	11.52	1.08	0.62
6	5.48	1.27	0.06	0.13	8.59	9.14	1.22	0.48
Average	-	1.23	0.06	0.13	9.46	10.07	1.13	0.51
	SA	L	VL	L	L	L	M	OP



Source: Bangladesh Metrological Department, Sylhet.

Figure 1. Minimum, maximum and mean temperatures (°C) pattern in Sylhet of Bangladesh



Source: Bangladesh Metrological Department, Sylhet.

Figure 2. Annual rainfall (mm) pattern in Sylhet of Bangladesh

Tomato

Two improved tomato varieties *viz.* BARI Tomato-14 and BARI Tomato-15 were tested with locally popular hybrid variety Raja, seeds was purchased from local market. The crop was fertilized with 151-58-52-23-0.5 kg ha⁻¹ of NPKSZn (FRG, 2012) and cow dung at 5 t ha⁻¹. Half of cow dung and P & entire amount of S and Zn were applied during final land preparation. The remaining half of cow dung and P was applied to the pits before a week of planting. N and K were applied in 3 equal installments at 21, 35 and 50 days after seedling transplanting. Thirty days old seedlings were planted during 25-30 November with a spacing of 60 cm x 40 cm. Fruits were harvested during 20 January to 20 March in each year. Three irrigations at 25 days interval from the transplanting of seedlings; one weeding at 20 DAP; two sprays of Score fungicide @ 1.5m l⁻¹ for controlling late blight disease and all other intercultural activities were carried out as and when needed.

Country bean

Two varieties of country bean *viz.* BARI Sheem-6 and local check (Goalgadda) were evaluated. The trial was laid out in RCB design with four dispersed replications. The unit plot size was 5 m x 8 m. The pit was prepared at a spacing of 1.5 m x 1.5 m. The fertilizers were used @ 28-40-75-12-2-1kg ha⁻¹ of NPKSZnB and cow dung @ 5 t ha⁻¹ was used. Half of the quantity of cow dung was applied during final land preparation. The remaining half of the cow dung, the entire amount of P, Zn and B and half of N and K were applied during pit preparation. The rest of N and K were applied as top dressing at 30 days after planting. Intercultural operations like watering, staking, preparation of trellis were done as and when necessary for each

dispersed replications. Seeds were sown during 25-29 August and harvesting started from third week of November and continued up to first week of March in each year.

Brinjal

Two Bt brinjal varieties *viz.* BARI Bt Begun-1 and BARI Bt Begun-2 against non-Bt counterparts *viz.* BARI Begun-1 and BARI Begun-4 was evaluated. One row of non-Bt counterpart of each variety was planted as border crops. The unit plot size was 20 m × 20 m for each Bt Begun variety with spacing of 100 cm × 80 cm. Stable bleaching powder @ 25 kg ha⁻¹ was applied 20 days before transplanting as a preventive measure against bacterial wilt. Thirty days old seedlings were planted during 17-22 November and fruits were harvested from 19 February to 25 April in each year. NPKSBZn @ 138-40-100-18-1.7-3.6 kg ha⁻¹ of and cow dung 10 t ha⁻¹ were used. One third MoP and rest of the fertilizers except urea were applied during final land preparation. Remaining two-third of MoP was divided into three splits and applied at 20 DAP, at flowering and fruiting stage. Urea was applied in four equal installments at 20 DAP, at flowering and two times at fruiting stage. Plant protection measures and other intercultural operations were taken as and when necessary as per recommendation.

Capsicum

The capsicum var. BARI Mistimorich-1 was evaluated with locally popular cultivated hybrid variety California Wonder; seeds were purchased from local market. Thirty 30 days old seedlings of capsicum were planted during 22-26 November and raised under nylon net at seed bed. The unit plot size was 5m×8 m with maintaining the spacing of 50 cm × 40 cm. The crop was fertilized with 100-66-100-20-2-5000 kg ha⁻¹ of NPKSZn (FRG, 2012). Half of N, full dose of other fertilizers and cow dung were applied as basal in the form of urea, triple super phosphate, muriate of potash, gypsum and zinc sulphate, respectively. The remaining N was top dressed at 25 and 50 days after transplant of seedlings followed by irrigation. Plant protection and management practices were followed as per recommendation (Azad et al., 2017). Harvesting of fruits was started from 24 January and continued up to 29 March each year.

Summer country bean

Performance of BARI Sheem-7 was compared with locally popular Patasheem. The unit plot size was 8 m x 10 m with 6 dispersed replications. The pit was prepared by maintaining spacing of 1.5m× 1.5 m. The seeds of both varieties were sown in the pits during 10-15 April. NPKS fertilizers @ 28-40-75-5 kg ha⁻¹ of along with cow dung @10 t ha⁻¹ were applied. The entire amount of cow dung and gypsum was applied during final land preparation. The total quantity of P and half of N and K were applied at 4-5 days before sowing seeds to the pits and mixed thoroughly with soils. The rest of N and K were applied as top dressing at 30 days after seed sowing. Intercultural operations like watering, staking, preparation of trellis were done as and

when necessary for each dispersed replications. The insecticide Sumithion @1.5 ml l⁻¹ of water was applied for controlling Jassid and white fly. The flowering started during first week of July and harvesting started during second week of July in each year.

The yield data were rerecorded on whole plot basis and mean values were adjudged using least significant difference (LSD) test or using t-test in case of two treatments at 5% level of significance.

RESULTS AND DISCUSSIONS

Tomato

The marketable fruit yields of tested tomato varieties grown under trial are presented in table 2. The results revealed that var. BARI Tomato-14 and BARI Tomato-15 fetched an average fruit yield of 55.60 and 48.93 t ha⁻¹, respectively against 47.55 t ha⁻¹ in local check. Similar findings were reported by Anonymous, (2016). The results revealed that BARI Tomato-14 exhibited the best performance at farmer's field. The data showed that significant increase of tomato yield i.e. up to 16.93 % over control. The fruit yield increase of 16.93% in case of var. BARI Tomato-14 followed by 2.90% in BARI Tomato-15.

Table 2. Fruit yield of winter tomato varieties at farmer's field under acidic soil of Sylhet during 2014-15, 2015-16 and 2016-17

Variety	Fruit yield (t ha ⁻¹)			Average fruit yield (t ha ⁻¹)	Fruit yield increased over local control variety (%)
	2014-15	2015-16	2016-17		
BARI Tomato-14	63.11	51.50	52.20	55.60	16.93
BARI Tomato-15	55.48	45.30	46.00	48.93	2.90
Raja (hybrid)	53.80	43.07	45.77	47.55	-
Local					
CV (%)	4.25	3.93	7.53	5.24	
LSD (0.05%)	5.54	1.83	2.53	3.30	

Country bean

Locally adopted variety performed better and produced higher yield of green pod (14.31 t ha⁻¹) compared to that of BARI Sheem-6 (11.64 t ha⁻¹) in during the trial years. An average fruit yield of 14.31 t ha⁻¹ was recorded with 18.24% low yield over local check variety. The yield decrease indicating high feasibility of its adoption among farmers. This variety has become most popular in the area which is exporting aboard as commercial variety.

Table 3. Green pod yield of country bean varieties at farmer's field under acidic soil of Sylhet during 2014-15, 2015-16 and 2016-17

Variety	Green pod yield (t ha ⁻¹)			Average pod yield (t ha ⁻¹)	Yield decreased over local (%)
	2014-15	2015-16	2016-17		
BARI Sheem-6	11.73	11.85	11.35	11.64	18.24
Local check (Goalgadda)	14.55	14.86	13.52	14.31	-
t-value	4.42	4.52	3.15	4.03	

Brinjal

Over the three years trial period, Bt varieties performed better and produced comparable higher fruit yields than non-Bt varieties. The highest average fruit yields 25.62 and 22.84 t ha⁻¹ were produced by BARI Bt Begun-2 and BARI Bt Begun-1, respectively; while non-Bt was the lowest yielder. The results are fully in agreement with the finding of trials conducted in different areas of Bangladesh (Anonymous, 2015). The results revealed that brinjal var. BARI Bt Begun-2 produced on an average yield of 25.62 t ha⁻¹ with 107.62% yield increase over non-Bt as check.

Table 4. Fruit yield of Bt Begun varieties at farmer's field under acidic soil of Sylhet during 2014-15, 2015-16 and 2016-17.

Variety	Fruit yield (t ha ⁻¹)			Average fruit yield (t ha ⁻¹)	Fruit yield increase over non-Bt(%)
	2014-15	2015-16	2016-17		
BARI Bt Begun-1	23.80	21.40	23.31	22.84	86.30
BARI Begun-1	11.20	13.38	12.20	12.26	-
BARI Bt Begun-2	26.30	25.09	25.47	25.62	107.62
BARI Begun-4	12.80	12.42	11.79	12.34	-
CV (%)	5.98	14.57	4.74	8.43	
LSD _(0.05)	1.53	4.11	2.18	2.61	

Capsicum

The results revealed that California Wonder (Local check) performed better and produced higher fruit yields than BARI Mistimorich-1. The former variety provided maximum average fruit yield (14.02 t ha^{-1}) with 22.77 % increase yield over the var. BARI Mistimorich-1.

Table 5. Fruit yield performance of capsicum varieties at farmer's field under acidic soil of Sylhet during 2014-15, 2015-16, 2016-17

Variety	Fruit yield (t ha^{-1})			Average fruit yield (t ha^{-1})	Yield decreased over local (%)
	2014-15	2015-16	2016-17		
BARI Mistimorich-1	11.48	11.76	11.03	11.42	-
Local check (California Wonder)	13.92	14.45	13.68	14.02	22.77
t-value	2.43	2.00	4.03	2.82	-

Summer country bean

Performance of summer country bean var. BARI Sheem-7 was compared with locally popular cultivar Patasheem as check. It was observed that BARI Sheem-7 performed better with 31.11 % increase yield over existing local cultivar. Similar findings were also reported by Islam et al. (2015) in field crops under charland situations.

Table 6. Fruit yield performance of summer country bean varieties at farmer's field under acidic soil of Sylhet during 2014-15, 2015-16 and 2016-17

Variety	Fruit yield (t ha^{-1})			Average fruit yield (t ha^{-1})	Yield increase over local cultivar(%)
	2014-15	2015-16	2016-17		
BARI Sheem-7	15.36	15.46	14.07	14.96	31.11
Local check (Patasheem)	11.69	11.87	10.68	11.41	-
t-value	5.04	3.83	5.63	4.83	-

CONCLUSION

The results of the trials conducted for 3-years revealed that tomato var. BARI Tomato-14; brinjal var. BARI Bt Begun-2; locally grown Capsicum var. California Wonder and summer country bean var. BARI Sheem-7 performed better under the soil and climatic conditions of Sylhet region.

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