Performance of some high yielding garlic varieties at two locations of Bangladesh

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Abstract

The experiment was conducted at Ulipur, Kurigram and Gabtoli, Bogra for two consecutive rabi seasons (2010-11 to 2011-12) to observe the performance of some high yielding garlic varieties (BARI Roshun 1, BARI Roshun 2, BAU Roshun 1 and BAU Roshun 2) including local variety at farmer's field. In Kurigram, the highest yield (8.11 and 8.04 t ha^{-1} during two successive years) was obtained from BARI Roshun 2, which differed significantly from other varieties. In Bogra, the highest yield (12.01 and 11.82 t ha^{-1} during two successive years) was obtained from BAU Roshun 2, which differed significantly from other varieties but in the second year it was statistically identical to BAU Roshun 1. In Kurigram, the highest gross return (Tk. 405500 and 241237 ha^{-1}) and the highest gross margin (Tk. 308325 and 97664 ha^{-1}) were obtained from BARI Roshun 2 where as in Bogra, the highest gross return (Tk. 960000 and 574000 ha^{-1}) and the highest gross margin (Tk. 826217 and 433081 ha^{-1}) were obtained from BAU Roshun 2 during two successive years. The lowest gross return and gross margin was obtained from local variety at both locations.

Keywords: Garlic, HYV, Yield, Cost, Return

Introduction

Garlic (Allium sativum L.) is one of the most important aromatic herbaceous annual spices under the family Alliaceae (Kurian, 1995). It is the second most widely used cultivated Allium after onion (Bose and Som, 1990) with a characteristic of pungent smell. Garlic was originated from central Asia, particularly Mediterranean region (Thompson and Kelly, 1957). Garlic has been recognized all over the world as a valuable spice for cooking different dishes. Garlic has been considered as rich source of carbohydrate, protein and phosphorus. It contains about 30-35% dry matter, 6-7% protein, 0.2% lipid and 23-28% carbohydrates. It also valued for its content of essential oil (Maly et al., 1998). Garlic plays an important role for the treatment of different types of disease such as chronic infection of stomach and intestine dysentery, typhoid, cholera and disease of lungs as Ayurvedi and Unani (Chopra et al., 1958). Aqueous extracts of garlic cloves (allicin and related disulphides) significantly reduce cholesterol level (Augusti, 1977). Garlic cloves extracts also play important role in reducing percent damping-off of tomato, eggplant and chilli seedlings (Islam and Faruq, 2012) and controlling anthracnose of mango, to increase the yield and quality mango per unit area (Chowdhury et al., 2007). In Bangladesh garlic cultivated in 37072 ha land and produces 164392 metric ton with an average yield of 4.43 t ha^{-1} (BBS 2010). The yield is quite low in the world context. This low yield may be due to the cultivation of the low yielding local varieties, incidence of diseases and insects, lack of technical knowledge etc. Spices Research Centre, BARI developed two garlic varieties namely BARI Roshon 1, BARI Roshon 2 and Bangladesh Agricultural University developed BAU Roshon 1, BAU Roshon 2 which are supposed to be high yielding varieties and less susceptible to insects, pests and diseases. These varieties have potential to help generate farmers' income in very short period of time. The present study was conducted to evaluate the performance of the varieties under farm condition and popularize them among the farmers to promote their adoption in the specific areas.

Materials & Methods

The experiment was conducted to observe the performance of different modern garlic varieties at MLT Site, Ulipur, Kurigram, and MLT Site, Gabtoli, Bogra, for two consecutive rabi seasons (2010-11 to 2011-12). The land was medium high and the soil was sandy loam in texture. The experiment was laid out in a RCB design with six disperse replications having unit plot size 5m x 6m. There were five varieties viz.

(BARI Roshun 1, BARI Roshun 2, BAU Roshun 1, BAU Roshun 2 and Local) at both the locations. In MLT site Kurigram, the Seeds (cloves) were sown during 7-12 November 2010 (Year 1) and 3-10 November 2011 (Year 2) with a spacing of 20 cm x 10 cm. Soil was fertilized with N-P-K-S-Zn-B-Cowdung at the rate of 115-54-165-20-4-1.7-5000 Kg ha^{-1} respectively. The entire amount of P-K-S-Zn-B-Cowdung and ½ of N were applied at final land preparation. Remaining N was applied in equal two splits at 25 and 50 DAS as top dressing. The crop was harvested on 24 to 27 March in each year. In MLT site, Bogra the cloves were sown during 2-4 November 2010 (Year 1) and 29-30 October 2011 (Year 2). The crop was fertilized as per recommendation of Spices Research Centre (N-P-K-S-Cowdung at the rate of 100-53-167-20-5000 Kg ha^{-1} respectively), BARI. The entire amount of P-K-S- Cowdung and ½ of N were applied at final land preparation. Remaining N was applied in equal two splits at 25 and 50 DAS as top dressing. Irrigation was provided twice at 25 and 50 DAS. The crop was harvested on 24 to 25 March in each year. Plant protection measures and other intercultural operations were done as and when necessary at both the locations. Data on yield and yield contributing characters (weight of bulb with leaf plant^{-1}, weight of bulb without leaf plant-^{1}, number of bulb m^{-2}, no of cloves bulb^{-1}, length of bulb and diameter of bulb) were taken and statistically analyzed following MSTAT software package.

Gross return (GR), total variable cost (TVC) and gross margin (GM) have been calculated using the following formula:

GR = Return of main product.
     = Yield Price (Tk.)
TVC = All input cost except land cost and interest on operating capital.
GM = GR-TVC.

Results and Discussion

In multi-location testing site, Kurigram

The results presented in Table 1 revealed that there was significant difference among the varieties in respect of plant height (cm), weight of bulb with leaf plant^{-1}, weight of bulb without leaf plant^{-1} and number of bulb m^{-2} which might have increased yield significantly. The highest plant height was obtained from BARI Roshun 1 and the highest weight of bulb with leaf plant^{-1}, weight of bulb without leaf plant-^{1}, number of bulb m^{-2} were recorded from BARI Roshun 2 which was significantly different from other varieties during two successive years. The highest yield (8.11and 8.04 t ha^{-1} during two successive years) was obtained from BARI Roshun 2 which was significantly different from other varieties. The lowest yield (6.38 and 5.50 t ha^{-1} during two successive years) was obtained from local variety.

Table 1. Yield and yield contributing characters of garlic at MLT site, Ulipur, Kurigram during 2010-11 to 2011-12

Varieties	Plant height (cm)	Wt. of bulb with leaf plant^{-1} (g)	Wt. of bulb without leaf plant^{-1} (g)	Bulbs m^{-2}	Yield (t ha^{-1})
Year 1					
BARI Roshun 1	69.84	35.50	18.83	49.16	7.86
BARI Roshun 2	67.02	37.02	19.47	49.27	8.11
BAU Roshun 1	68.00	35.23	19.10	48.93	7.94
BAU Roshun 2	64.20	36.63	18.25	48.83	7.87
Local	65.00	33.38	18.00	47.67	6.38
CV (%)	6.01	5.75	3.77	0.88	5.45
LSD value(0.05)	5.198	2.614	0.909	0.557	0.685
Year 2					
BARI Roshun 1	59.55	38.25	17.55	47.91	7.83
BARI Roshun 2	59.15	39.25	17.95	48.66	8.04
BAU Roshun 1	58.90	37.25	16.95	47.91	7.91
BAU Roshun 2	55.60	37.00	16.55	47.58	7.12
Local	54.90	35.25	16.45	44.50	5.50
CV (%)	5.43	2.16	2.72	0.89	3.91
LSD value(0.05)	4.823	1.242	0.716	0.65	0.438

In multi-location testing site, Bogra

The results presented in Table 2 revealed that there was significant difference among the varieties in respect of plant height (cm), no of cloves bulb^{-1}, length of bulb (cm), diameter of bulb (cm) and wt of bulb plant^{-1} (g) which might have increased yield significantly. The highest plant height (60.60 and 60.18 cm during two successive years) was obtained from BARI Roshon 1. The highest number of cloves bulb^{-1} (27.65 and 27.47), length of bulb (4.08 and 4.23 cm), diameter of bulb (10.88 and 11.04 cm), and weight of bulb Plant^{-1} (24.02 and 23.65 g) were recorded from BAU Roshon 2 in the two successive years. The highest yield (12.01 and 11.82 t ha^{-1} during two successive years) was obtained from BAU Roshun 2 which was significantly different from other varieties but in the second year it was statistically identical to BAU Roshun 1. The lowest yield (6.23 and 6.00 t ha^{-1} during two successive years) was obtained from local variety.

Table 2. Yield and yield contributing characters of Garlic varieties at the MLT site, Gabtoli, Bogra during 2010-11 to 2011-12

Varieties	Plant height (cm)	No of cloves Bulb^{-1}	Length of bulb (cm)	Diameter of bulb (cm)	Wt of bulb Plant^{-1} (g)	Yield (t ha^{-1})
Year 1						
BARI Roshun 1	60.60	20.78	3.75	9.73	13.20	6.60
BARI Roshun 2	58.1	23.20	3.85	9.90	16.78	8.40
BAU Roshun 1	60.55	24.43	3.93	9.68	21.33	10.67
BAU Roshun 2	59.47	27.65	4.08	10.88	24.02	12.01
Local	53.43	19.00	3.30	9.36	12.47	6.23
LSD (0.05)	5.159	1.473	0.403	0.6269	1.811	0.9037
CV (%)	7.33	5.31	8.59	5.25	8.56	8.54
Year 2						
BARI Roshun 1	60.18	20.63	3.70	9.68	13.08	6.55
BARI Roshun 2	57.90	22.87	3.91	10.03	16.60	8.30
BAU Roshun 1	60.03	24.10	3.95	9.70	21.00	10.48
BAU Roshun 2	59.30	27.47	4.23	11.04	23.65	11.82
Local	52.65	18.87	3.50	9.40	12.02	6.00
LSD (0.05)	4.54	3.06	0.715	0.713	3.025	1.43
CV (%)	6.34	7.94	9.18	9.18	10.42	10.66

Cost and return

Total variable cost (TVC) includes items of operation cost like, labour, ploughing, seed, fertilizer, irrigation and pesticides etc. In Ulipur, Kurigram labour cost was the highest (Tk. 21000 ha^{-1} and Tk. 24000 ha^{-1}) during the two following years 2010-11 and 2011-12. The second highest cost was the fertilizer cost followed by seed, insecticides, irrigation and ploughing. The TVC of garlic in the year 2010-11 was Tk. 137175 ha^{-1} and in the year 2011-12 was Tk. 143573 ha^{-1}. Similar results were found in Gabtali, Bogra in the two following years. The TVC of garlic in the year 2010-11 was Tk. 133783 ha^{-1} and in the year 2011-12 was Tk. 140919 ha^{-1} in Gabtoli, Bogra.

The economic performance of different garlic varieties are presented in Table 4 and 5. In MLT site, Kurigram the highest gross return (Tk. 405500 and 241237 ha^{-1}), gross margin (Tk. 308325 and 97664 ha^{-1}) and benefit cost ratio (2.96 and 1.68) was obtained from BARI Roshun 2 and in MLT site, Bogra the highest gross return (Tk. 960000 and 574000 ha^{-1}), gross margin (Tk. 826217 and 433081 ha^{-1}) and benefit cost ratio (7.18 and 4.07) was obtained from BAU Roshun 2 during two successive years. The lowest gross return, gross margin and benefit cost ratio was obtained from local variety at both the Locations.

Table 3. Cost of production of garlic under different cost items in Ulipur, Kurigram and Gabtoli, Bogra

Items of Operation	Ulipur, Kurigram		Gabtoli, Bogra	
	2010-11	2011-12	2010-11	2011-12
Labour	70500	77700	61180	73500
Ploughing	6000	6000	6000	6000
Seed	21000	24000	28000	24000
Cowdung	5000	5000	5200	5000
Urea	3640	4400	2640	4400
TSP	5720	6240	5720	6240
MoP	8250	4950	8250	4950
Gypsum	770	1110	770	1100
Boric	1440	1440	1440	1440
Irrigation	6000	4850	6000	5200
Insecticide	8855	7883	8583	9089
Total	137175	143573	133783	140919

Table 4. Cost and return analysis of garlic varieties at MLT site, Ulipur, Kurigram during 2010-11 to 2011-12

Varieties	Gross return (Tk.ha^{-1})	Total variable cost (Tk.ha^{-1})	Gross margin (Tk.ha^{-1})	BCR
Year 1				
BARI Roshon 1	393000	137175	255825	2.86
BARI Roshon 2	405500	137175	308325	2.96
BAU Roshon 1	397000	137175	259825	2.89
BAU Roshon 2	393500	137175	256325	2.87
Local	369000	137175	231825	2.69
Price (Tk.kg^{-1}): Urea - 12 , TSP - 22, MP - 25, Gypsum - 7, Boric acid - 180, Garlic - 50				
Year 2				
BARI Roshon 1	234997.5	143573	91424	1.63
BARI Roshon 2	241237.5	143573	97664	1.68
BAU Roshon 1	237487.5	143573	93914	1.65
BAU Roshon 2	213742.5	143573	70169	1.49
Local	164992.5	143573	72819	1.15

Price (Tk.kg^{-1}): Urea - 20, TSP - 24, MP - 15, Gypsum - 10, Boric acid - 180, Garlic - 30

Table 5. Cost and return analysis of Garlic varieties at the MLT site, Gabtoli, Bogra During 2010-11 to 2011-12

Varieties	Gross return (Tk.ha^{-1})	Cost of production (Tk.ha^{-1})	Gross margin (Tk.ha^{-1})	BCR
Year 1				
BARI Roshun 1	528000	133783	394217	3.95
BARI Roshun 2	672000	133783	538217	5.02
BAU Roshun 1	853600	133783	719017	6.38
BAU Roshun 2	960000	133783	826217	7.18
Local	498400	133783	364617	3.73
Market price of Garlic @ Tk 80 kg^{-1}				
Year 2				
BARI Roshun 1	327500	140919	186581	2.32
BARI Roshun 2	415000	140919	274081	2.94
BAU Roshun 1	524000	140919	383081	3.72
BAU Roshun 2	574000	140919	433081	4.07
Local	300000	140919	159081	2.13

Market price of Garlic @ Tk. 50 kg^{-1}

Conclusion

From the two years study, it may be concluded that improved/HYV garlic varieties showed better performance than local variety and BARI Roshun 2 and BAU Roshun 2 gave higher yield in Ulipur, Kurigram and Gabtoli, Bogra respectively.

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