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'Baromashi' – A Year Round Good Quality Pumpkin Variety Raises A New Hope to the Pumpkin Growers

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Abstract

An excellent year round open pollinated pumpkin variety 'Baromashi' has been developed from the local germplasm through selection at BRAC Agricultural Research & Development Centre (BARDC). Its robust type healthier plants have an outstanding fruit bearing habit and this particular pumpkin variety is well adapted to all parts of Bangladesh. In the *Rabi* season, its yield is around 50-55 Mt/ha while in the *Kharif* season its yield has been recorded as 35-40 Mt/ha. Its dark green coloured marketable size fresh fruits with orange flesh can be harvested just 70-80 days after transplantation while ripened fruits can be harvested at 100-110 days. Near about 4-5 kg uniform size fruits of 'Baromashi' variety are usually high round shaped and these fruits have much thicker flesh compared to other local varieties. Flesh colour of its fruits is very much attractive due to excellent orange colour and the pumpkin is very tasty as its TSS is 8 – 11 ^{o}Brix. This 'Baromashi' pumpkin variety has been released by BRAC during the year 2011-12 and as its seed production is also profitable pumpkin growers are showing interest to grow this pumpkin variety both by the Bangladeshi farmers and the pumpkin growers of the African country Uganda as well.

Keywords: Pumpkin, open pollinated variety, year round variety, hybrid, nutrition.

INTRODUCTION

Pumpkin or sweet gourd (*Cucurbita moschata* Duch ex Poir) belongs to the family cucurbitaceae is an important vine crop grown widely as vegetables in Bangladesh (Hoque *et al*., 2015) and it is also one of the leading major vegetable crop of the subtropical regions of the world (Tadmore *et al*., 2005). Its fruits, vines, flowers, seeds as well as thicker rinds of the matured fruits are extensively consumed by the Bangladeshi people and this is why pumpkins are cultivated both commercially as well as in the homestead areas of every part of this country. Another advantage of pumpkin cultivation is that its ripened fruits can be stored for 3-4 months easily and can be sold at higher price when the price of pumpkin goes high in the vegetable market. In Bangladesh annually 1.17 thousand hectares of lands are cultivated by pumpkin and 11.90 thousand metric tons of pumkins are produced with an average yield of 8.8 Mt/ha year (Hoque *et al*., 2015). Fruits of pumpkin are very nutritious (Paris 2005) and its fruits and seeds are also a good source of β-carotene, carbohydrates, minerals, proteins and other vitamins (Yadav *et al*., 2010). Pumpkin is therefore, believed to have the potentiality to prevent malnutrition problem in the poorer countries to some extent (Hoque *et al*., 2015). Besides nutritional value it has got therapeutic properties (Yadav *et al*., 2010) and pumpkin is also one of the natural sources of bioactive compounds (antioxidants and antimicrobials) as well (Saavedra *et al*., 2013). Due to sweeter taste its matured fruits are also used to make confectionery, beverages and alcoholic products (Yadav *et al*., 2010). It is believed that originally its fruits were not sweeter and tasty like the present day pumpkin rather they were to some extent bitter in taste

and a mutation in the early phase of its domestication has changed its bitter taste into present day's pumpkin which is not only sweeter in taste but also tastier as well (Paris *et al*., 2003). In Bangladesh generally pumpkin is grown in the *Rabi* season as relatively shorter day length and moderate to lower temperature is required to induce maximum female flowering and high temperature along with longer day length inhibits the production of female flower. In Bangladesh, in some regions it is also being grown as 'relay crop' with potato to earn more profit. With the increasing demand of pumpkin it is imperative to develop high yielding varieties of pumpkin as the traditional varieties are low yielder, inferior quality and these varieties are susceptible to diseases. Therefore, considering the huge importance of pumpkin in Bangladesh as well as its demand in other countries particularly in African countries like Uganda; in order to develop high yielding improved varieties BRAC started a pumpkin variety development program during the year 2000 and so far one open pollinated variety of pumpkin has been released for commercial cultivation by BRAC Agricultural Research and Development Centre. And the chronicle of the newly developed open pollinated variety 'Baromashi' has been elaborated in this communication.

MATERIALS AND METHODS

For evaluation of germplasms leading to the development a new variety all along 16 pumpkin entries were collected from local and exotic sources and were given accession number accordingly as a part of variety development program. These germplasms were evaluated in the Rabi season of 2004-2005 at BRAC Agricultural Research and Development Centre. Seeds of these accessions were sown on 10m X 2.5m beds keeping the plant spacing 2m. Recommended doses of fertilizer were applied to ensure proper growth and development of each and every plants. Necessary cultural practices were also provided as and when required. Critical observations were carried out from the very seedling stage to identify variations between the germplasms. Off type plants were removed from the field through rogueing. Each of the accessions was selfed through bagging followed by forced hand pollination. Good quality fruits were harvested from selfed flowers. TSS (Total Soluble Solid) was determined through Brix value using refractometer. Healthy seeds were collected from the ripened fruits having good shape and size after curing. Uniformity as well as stability of the lines was increased through generation advancement method. Both bed cultivation as well as trellis cultivation techniques were followed to advance the generations. After finishing successful trials of the promising advance line in Dinajpur and Meherpur seed farm it was released as a commercial variety in the name of 'Baromashi'. Seeds of the 'Baromashi' pumpkin were also sent to BRAC Agriculture Farm, Uganda and its performance was tested in the African soil as well. Observing better performance seed production of 'Baromashi' pumpkin was started in Uganda and sold it to the market.

RESULTS AND DISCUSSION

***Isolation of the promising line*:**

In the Rabi season during the evaluation of germplasms at the early part of the growing stage plants of PUM 003 were found to be healthier than other accessions. Plants of this particular code were found to be more uniform as well with good spreading habit and were characterized by early flowering. Despite its good uniformity in other characteristics, some of the fruits of this accessions had different shapes and sizes viz. high round type fruit and elongated round shaped fruits. Along with different shapes and sizes some of the fruits of this accession had normal green rind colour while others had spotted fruits although the frequency of high round type fruits with normal green rind colour were maximum (Fig.3 & 4). Almost all the plants of this accession were virus free and produced healthier fruits. These fruits had relatively thicker flesh and the average fruit wt. was recorded as 4.50 – 6.50 kg (Table. 1).

Table.1. Morphological characters of PUM 003.

Values	Main vine length (cm)	No. of branches/ plant	No. of fruits/ plant	Fruit length (cm)	Fruit girth (cm)	Fruit wt. (gm)	Yield/ha (Mt)	Remarks
Mean	410.00	6.70	1.40	17.10	72.00	5.27	25.23	High round shaped fruits with shallow ribs. Flesh was found to be yellow coloured at both green fruit stage and at ripening stage. Taste of the less fibrous flesh was also found to be good.
Range	(425.00 - 570.00)	(5.00 – 8.00)	(1.00 - 2.00)	(16.00-18.00)	(68.00-80.00)	(4.50-6.50)	(18.34-33.56)	

Table.2. Fruit & Seed Characteristics of 'PUM 003' grown in the Rabi Season of 2016 – 2017 .

Sl. no	Advance line	Rind colour		Fruit wt. (kg)	Flesh type	Flesh colour	Seed size	Seed wt./fruit (gm)		TSS (^{o}Brix)
		Fresh	Ripened					Fresh	Dry	
01	PUM 003	Dark green	Brownish green	3.37- 5.22	Thicker to medium thick	Deep orange to orange	Medium	54.00	33.00	8.00-11.00

Table. 3. Comparative study of the performances of BARDC developed 'Baromashi' and commercial F_1 hybrid pumpkin variety (PK 01/17) grown during the Kharif-1 season of 2017.

Seeding date	Variety	Source	Test season	Days taken to				Total no. of harves-ting	Dura -tion	Fruit wt./ fruit (kg)	Yield (Mt/ acre)	Remarks
				1st flowering	1st picking of fresh fruits	50% picking of fresh fruits	Final harvesting					
22.03.17	Baromashi	BARDC	Kh-1' 2017	49 DAS	70.00	81.00	93.00	7.00	93.00	3.30	29.31	86.33% increased yield in 'Baromashi' was recorded than hybrid variety PK 01/17 .
	PK 01/17	Enza Zaden Seed		50 DAS	68.00	82.00	93.00	5.00	93.00	2.50	15.73	

Fig.1. Baromashi in BARDC , Gazipur (season Rabi 2016-17).

Fig.2. Baromashi of BARDC (at green fruit stage).

***Generation advancement of the promising line and release of the variety*:** To increase the stability and to make the population more homogenous, healthier plants of the advance line PUM 003 having good fruiting habit was selected in each generation and was selfed accordingly. Successive generation advancement resulted greater uniformity to the advance line. Due to its good fruit bearing habit, better adaptability and having the potentiality to produce sufficient quantity of seeds later this advance line was released as 'Baromashi' pumpkin variety to the commercial growers (Table. 2 & 5) after finishing different trials. In a recent trial experiment 'Baromashi' gave 86.34% increased yield than a commercial hybrid pumpkin variety of Enza Zaden seeds (Table. 3).

Main Characteristics of the variety 'Baromashi':

1. *Easy growing variety and its healthy seedlings are stronger & disease free.*

2. *More or less uniform robust plants with good spreading habit.*
3. *Early matured pumpkin variety and its plants exhibited high degree of femaleness.*
4. *Excellent fruit bearing capacity and fruits had dark green coloured rind at young stage and rind colour become greenish brown to brown at the ripening stage.*
5. *Green fruits can be harvested after 65-70 days after transplantation and ripened fruits can be harvested at 110-120 days after seeding.*
6. *Its fruits have thicker flesh and its deep orange to orange colored flesh is very tasty when it is cooked.*
7. *Relatively tolerant to virus and other major diseases.*
8. *Yield per hectare is around* 50-55 *Mt/ha* in *the Rabi season* and *35-40 Mt/ha in the Kharif season.*
9. *Seed production of this variety is also profitable.*
10. *This is a year round variety can be grown profitably in the Kharif -1 & Kharif -2 season besides normal cultivation in the Rabi season.*

Fig. 3. 'Baromashi' (season: Rabi' 2015).

Fig. 4. 'Baromashi' (season: Kharif-1' 2017).

Fig. 5. 'Baromashi' at ripened stage.

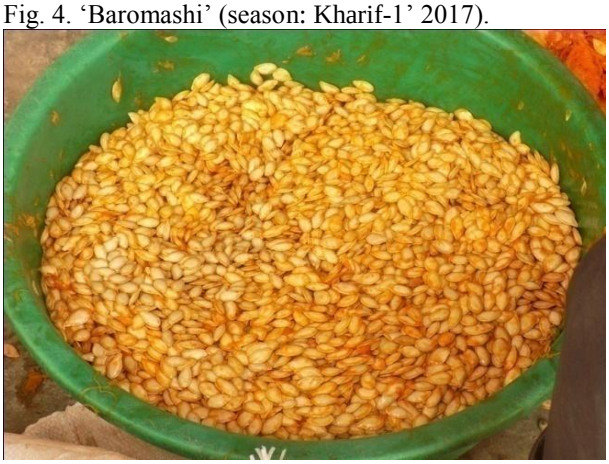

Fig. 6. Seed collection from'Baromashi' pumpkin.

Fig. 7. F_1 Hybrid (*Saint X Baromashi*) using *Baromashi* as male parent.

Fig. 8. Another F_1 Hybrid (*MK X Baromashi*) using *Baromashi* as male parent.

Table.4. Comparative study between BRAC pumpkin hybrids (using 'Baromashi' as parent) and other commercial hybrids.

Variety/lines	Source	Days taken to opening of 1st female flower	Days taken to 1st picking	Days taken to final picking	Fruit wt./fruit (kg)	Fruit shape	Sweet-ness	Uniformity rate	Reaction to diseases & pests	Yield/ha (Mt)
Saint X Baro-mashi	BRAC	60	84	136	3.50	High round	Mode-rate	Good	Tolerant to major diseases and insects	22.23
MK X Baro-mashi	BRAC	70	88	136	3.30	Semi round	Mode-rate	Good	Tolerant to major diseases and insects	32.11
Moyuri (Check variety)	United Seed	75	102	134	2.25	Round	Mode-rate	Good	Less tolerant to major diseases and insects	12.35
Sweety (Check variety)	Lal Teer Seed	78	94	137	2.80	Round flatte-ned	Mode-rate	Moderately uniform	Tolerant to major diseases and insects	29.64
Bangkok-1 (Check variety)	Jamalpur Seed	81	104	137	2.00	Round flatte-ned	Mode-rate	Good	Less tolerant to mosaic virus disease	22.23
Bangkok-2 (Check variety)	Jamalpur Seed	80	106	136	1.90	Round flatte-ned	Mode-rate	Good	Less tolerant to mosaic virus disease	19.76

Fig. 9. 'Baromashi' pumpkin in the experimental plots of Uganda.

Fig. 10. 'Baromashi' pumpkin (fruit having green rind colour) in a fair in Uganda.

Table. 5. Seed production data of OP pumpkin variety 'Baromashi'.

Sl. no	Year	Quantity (Kg)	Remarks
01	2013	68.00	At first Breeder's seed of 'Baromashi' was produced at BRAC Agricultural Research & Development Centre (BARDC) and these seeds were distributed to the seed production division for the production of foundation seed and finally using foundation seed certified seeds were produced through contract growers.
02	2014	658.00	Through maintenance breeding healthy plants with higher no. of excellent size fruits of 'Baromashi' variety were maintained at BARDC and 'Basic seeds' were produced. Using this source seed 'Foundation Seeds' were produced at Regional Farms and finally certified seeds were produced from this foundation seed.
03	2015	1797.00	Do
04	2016	1260.00	Do
05	2017	1000.00	Through Grow Out Trial (GOT) at BARDC the quality of procured seeds from contract growers were tested as a routine check and almost all the collected seeds from the farmers were found to be good quality seeds.
06	2018	1500.00 (Target)	-

In the Rabi season 'Baromashi' can be cultivated either in the open field on raised beds or on the trellis (Fig. 3). On the other hand, excepting the rabi season better production is achieved if 'Baromashi' is grown on trellis. Generally trellis grown fruits are more uniform and bears good shape as well as size as well and these fruits can be stored for a longer period (usually 3-4 months). In the Kharif-1 season usually its seeds are sown from mid March to mid April, and in this season usually 'Baromashi' pumpkins are grown on trellis to protect fruits from damage generally caused due to heavy rainfall in the rainy season. Growing pumpkin in this season is more profitable as pumpkin fetches higher price during this season. It's both fresh and ripened fruits are sold profitably in the market as good quality pumpkin. Trellis cultivation of pumpkin in the monsoon season in the homesteads is very common in Bangladesh and consumption of pumpkin vines of trellis grown pumpkin is a normal practice. Again, the same trellis can be used to grow country bean, yardlong bean or other vine crops after harvesting pumpkins and in this way cost of constructing trellis can be minimized.

Experimental findings have proven the fact that this variety is also a good combiner and using this variety as inbred excellent hybrids were obtained (Table. 4, Figs. 7 & 8). With respect to earliness *Saint X Baromashi* was found to be 10-22 days earlier than corresponding check varieties while *MK X Baromashi* exhibited higher yield than check varieties (Table. 4). Uniformity rate and fruit quality of the hybrids utilizing Baromashi as inbreds were also found to be better than check varieties. It can also be mentioned here that this high yielding pumpkin variety 'Baromashi' is also performing well in the African soil (in the BRAC farm of Uganda) (Figs. 9 & 10). Observing its demand in Uganda, BRAC has also started its commercial seed production in Uganda and good quality seeds are being distributed to the pumpkin growers of that particular African country. Commercial cultivation of 'Baromashi' variety has been started in Uganda during the year 2013-14 and now this pumpkin variety has become one of the very popular pumpkin varieties in Uganda as well. In Uganda, pumpkin is a very popular crop and its young leaves, fresh fruits and ripened fruits are extensively consumed and for this reason pumpkin fruits are sold in the super makets, roadside markets and other markets as well (Ndegwa 2016 and Musinguzi *et.al*, 2006).

Although hybrid pumpkin varieties are gradually becoming popular among the Bangladeshi pumpkin growers, good quality Open Pollinated Varieties (OPVs) of pumpkin still have a very good demand due to their lower price of seeds good adaptability and reasonable yield. And another advantage of OP variety is that as the seeds of the open pollinated varieties can be preserved for growing pumpkin in the successive years without compromising yield and quality of the pumpkin, a large section of farmers usually use open pollinated varieties. Yet again these open pollinated varieties are sometimes used as inbreds to produce good quality F_1 hybrids.

CONCLUSION

Since pumpkin is being cultivated in Bangladesh from the ancient period and its benefits are well documented and proven fact; demand of pumpkin is increasing day by day among the consumers and also among the commercial growers as well. Therefore, good quality seeds of a suitable pumpkin variety and finely tuned production technology can ensure the availability of this nutritional vegetable in the market throughout the year. And in this respect BRAC developed 'Baromashi' pumpkin variety has already become a popular variety and also can be a good variety for the pumpkin growers and consumers in years to come.

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