



## ‘Radish’- a versatile vegetable crop improves the rural economy of Bangladesh, a case study

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### Abstract

Considering the enormous importance of radish as a short duration vegetable crop and its wider use in the form of salad and other types of cooked food item BRAC- one of the largest Non Governmental Organization (NGO) in the world began its research activities on radish near about two decades ago in its own R&D centre and so far released two open pollinated and one hybrid radish varieties for commercial cultivation. Compared to local radish varieties these high yielding varieties are far better in terms of yield and quality. ‘Sufola 40’ and ‘China 35’ are open pollinated varieties while ‘White Star’ is a hybrid variety. All these varieties are showing excellent performance in the farmer’s field. Besides these seasonal type of radish varieties; BRAC scientists are also working on the development of off season type of radish variety and so far one promising summer radish advance line has been developed. Research work on ‘Shakmula’, ‘Green radish’ and ‘Bicoloured radish’ is also going on to create new market demand among the consumers and promote different kinds of radish cultivation in Bangladesh throughout the year.

**Keywords:** Hybrid variety, radish, *Raphanus sativus* L., seed industry, summer radish, variety development, vegetable seed production and yield.

Radish (*Raphanus sativus* L.) is one of the most important vegetable crop of Bangladesh (Rashid *et al.* 1983) has turned into a round the year vegetable in Bangladesh in recent years and this cruciferous vegetable is consumed by the Bangladeshi people as both root as well as leafy vegetable although few years back it was essentially a seasonal crop and its availability could be observed in the Bangladesh vegetable market only during the winter season. As it can be grown in wide range of environments i.e. from hilly to coastal areas easily (Ghosh *et.al.* 2014) and can be harvested as short duration crop its cultivation is becoming more popular in Bangladesh with the availability of suitable variety/varieties for the commercial growers complying with the rising demand of radish. Basically two major types of radishes white and red coloured radishes are grown in Bangladesh in the main season while in the off season only white coloured varieties are cultivated. At present in Bangladesh 22,052 hectares of land is cultivated by radish in which 20,0840 metric tons of radishes are produced annually (Mondal *et al.* 2011).

Since this nice flavored nutritious vegetable can be eaten as raw as well as in the cooked form and its productivity is very high; it captures huge vegetable growing areas in Bangladesh each and every year during the main winter season or ‘Rabi season’. Moreover, with the rapid expansion of garment and hotel industry in Bangladesh demand of radishes is also increasing as different types of items from these root vegetables such as salad, stir fried radish, half fried leaves of radish and in the traditional curry huge quantities of either entire plant or the slender roots of radishes are used. Again, in flood prone Bangladesh it is a unique crop in the flood affected areas as this short duration vegetable can provide excellent support to the flood victims by supplying huge quantity of vegetable within a very brief period after recession of flood water in the flood affected areas. Being radish is a root crop its roots are relatively safer as health hazardous pesticides barely come in contact with the pesticides usually sprayed to control pest attacks. At present high quality seeds of the extra early and off season radish varieties have a very good market in the vegetable seed

market of Bangladesh and seeds of both hybrid as well as open pollinated varieties are sold in Bangladesh almost throughout the year. To meet this growing demand of radish seeds, BRAC has launched a variety development as well as seed production program of radish during the year 2000 (Biswas 2009) and so far released 3 relatively short duration varieties (*Sufola-40*, *China 35* and *White Star*) with satisfactory yield performance and quality through its own variety development as well as variety screening program. It can be mentioned here that along with the variety development program, BRAC Seed & Agro Enterprise division also collects excellent quality seeds from reputed companies of Japan, China, India etc. and used to sell these top quality seeds to the growers after their confirmation of best quality varieties through adaptive trial. To reduce the dependency on foreign companies for radish seeds BRAC scientists are working relentlessly to develop different kinds of radish varieties for different market segments viz., *Seasonal type*, *Summer radish* (for summer season or off season radish), *Shak mula* (for extra early season to be used as leafy vegetable), *Green radish (Sabuj mula)* '*Bicoloured radish*' etc. Main characteristics of these varieties/ lines are:

**1. Seasonal type radish:** BRAC has 3 seasonal types of radishes:

i) ***Sufola -40*:** It has been developed through mass selection from a local germplasm and is characterized by very fast growing plants in which marketable size roots can be harvested within 46-47 days after sowing of seeds (Table. 1). Its slender white coloured smooth skinned roots are almost straight and do not produce any misshapen roots

(Fig. 1). Delayed pithiness of roots is also an important feature of its roots. Its juicy as well as crispy roots have mild pungency and have very good taste. Since its leaves are smooth, its tender fleshy leaves are also used as nutritious vegetables as well. Per hectare yield of this radish variety is 45-50 metric tons and can also be grown as an early season radish.

ii) ***China-35*:** It has been released during the year 2013. Basically this variety has been selected through adaptive trial. It is also a very popular and productive exotic radish variety. Relatively longer roots can be harvested just after 40-42 days of sowing seeds. Its smooth skinned slender radishes are juicy, crispy and have very mild pungency. Individual root wt. 200-210 gm and yield per hectare 49-50 Mt. Since it can give satisfactory yield in the main season as well as in the extra early season this particular variety also has a very good market demand among the vegetable growers of Bangladesh.

iii) ***White Star*:** It is a hybrid radish variety and has been released during the year 2012 after getting very good result from its adaptive trial experiment. Actually it is a heat tolerant variety and for this reason it usually performs much better in the extra early season than any other commercial radish variety. Marketable size bright white coloured roots can be harvested just after 40-41 days after sowing of seeds and yield per hectare 75-80 Mt.

**Table 1. Comparative study of BRAC radish variety 'Sufola-40' and varieties of other companies (Rabi season of 2012).**

Variety	Source	Season	Sowing date	Days taken to harvesting	Root wt./root (gm)	Yield (Mt/ha)	Income (Tk.) (considering selling price @ Tk. 15/= per kg)	Less income than Sufola-40
Sufola-40	BRAC	Rabi	13.09.12	47.00	344.80	45.44	6,81,600.00	-
Rocky 45	Lal Teer			54.00	273.20	36.10	5,41,500.00	1,40,100.00
Advanta 1005	Advanta			54.00	337.80	40.56	6,08,361.00	73,239.00
Advanta 1006	Seeds			55.00	228.30	12.47	1,87,050.00	4,94,550

**Table 2. Observational Yield Trial (OYT) of newly developed advance line of summer radish at 35 days after sowing (DAS).**

Line / Variety	Plant height (cm)	Root length (cm)	Root girth (cm)	Root wt. (gm)	Days required for commercial harvesting	Root uniformity (%)	Yield/ha (Mt)
	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$			
Rad 310	52.70±2.63 (48.00-55.00)	16.60±2.35 (14.50-22.00)	9.90±1.47 (9.00-12.00)	104.20±19.05 (90.00 -154.00)	40.00	50.13	39.00
Bright White-40 (Check variety)	43.60±2.80 (40.00-50.00)	17.20±2.74 (14.00-23.00)	8.95±1.21 (7.50-11.00)	75.90±22.24 (48.00-121.00)	45.00	23.35	21.56

$\bar{X} \pm S.D$  = Mean  $\pm$  Standard Deviation and values in the parentheses ( ) = range

2. **Summer Radish (Advance line):** This off season type radish has also been developed at BRAC Agricultural Research and Development Centre through screening from the different types of germplasm and this heat tolerant line can produce suitable size roots during the summer season (Fig. 2 & Fig. 3). Its marketable size roots can be harvested only after 30-35 days of sowing seeds if proper care is provided (Table. 2). Normally its seeds are sown in the field during the last week of March or 1<sup>st</sup> week of April and its suitable size roots can be made available at the end of April or May when practically there are few vegetable items are available in the kitchen market. The length of roots of summer radish ranges between 21-22 cm. and individual root wt. is around 150-160 gm. In this off season addition of radish in any cooked curry gives extra flavour and taste and this is why these summer radishes fetches higher price in the market in the summer season.

3. **Shak mula:** Since the farmers are very much interested to cultivate the extra early short duration leafy type radish variety (for the consumption of both roots and leaves simultaneously), very recently BRAC scientists have developed a market oriented very fast growing radish line named “*Shakmula*” in which both the shoot as well as root portions of the plant enlarges very quickly and just within 20-22 days the whole plants attain marketable size with huge foliage along with considerable size of roots (Fig. 4 & Fig. 5). Roots are usually reddish coloured and the fresh entire plant become edible within this very brief period and thus huge quantity of vegetables can be harvested from a small piece of land (yield is around 62-63 Mt/ha). As it has also better wet tolerant capacity, this variety can withstand relatively high moisture caused due to light rainfall at the terminal part of the monsoon season. \



Fig. 1. ‘Sufola 40’ and check variety ‘Rocky 45’.



Fig. 2. Summer radish; BARDC developed line Rad 310 (Left) and check variety ( Right).



Fig. 3. Radish plot in the summer season.



Fig. 4. Shak mula in the field (at 22DAS).



Fig. 5. Compare between ‘Shak mula’ & check variety ‘Rocky- 45’ of Lal Teer Seed Company (at 22DAS)



Fig. 6. “Shabuj mula” or Green radish



Fig. 7. Big size green radish.

4. **Green radish (Sabuj mula):** Green radish or 'Sabuj mula' is a special type of radish collected from China. Plants of green radish are characterized by relatively slower growth rate, deep green leaves and totally green coloured roots (Figs. 6 & 7). Roots became harvestable after 45-46 days of sowing of seeds and root wt. per root at this stage was found to be 140-150 gm. This line was characterized by very slower in bolting (at 124 DAS) as well. Its flesh is relatively hard and suitable for use in the curry or stir frying.



Fig. 8. Bicoloured radish

Fig. 9. Cross section of bicoloured radish

5. **Bicoloured radish:** This type of radish variety was brought from China to evaluate their adaptability performance under Bangladeshi agro-climatic conditions. Side by side an attempt was also made to assess their market demand in this radish loving country as well. In this good looking type of radish variety, the upper portion of the root is green while the lower portion is white (Fig. 8). Yield is around 41-42 Mt/ha. Its flesh is also light green coloured in the greenish part of the roots while the flesh colour of the whitish part is white (Fig. 9). Delayed pithiness was also recorded in its crispy uniform size roots and root wt. per root was recorded as 250-275 gm. Roots attained marketable size within 44-45 days. Moderate type yield was recorded in this variety (45-46 Mt/ha) and its taste is also good. Since it is an ornamental type radish, a good number of consumers liked this uncommon type of radish usually to decorate their dishes.

## CONCLUSION

At present BRAC Seed & Agro Enterprise is selling 17-18 metric tons of radish seeds annually and more radish varieties are expected to be released by BRAC in the coming years so that additional increased volume of seeds can be sold in the seed market. Side by side reducing the dependency on foreign company radish seeds is also one of its research objectives. Although development of seed industry in Bangladesh is at an infant stage but like this root crop continuous development of demand led varieties of different crops can give an impetus to flourish these industries in Bangladesh steadily.

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