Varietal Performance of Broccoli for Summer Season Production

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ABSTRACT

Broccoli is considered as a very high value vegetable, due to its high content of vitamins and minerals. An experiment was conducted to test varieties of broccoli for summer season (March-May) production during 2002 and 2003 at Agriculture Research Station, Pakhribas (1740 masl) in Randomize Complete Block Design (RCBD) with three replications. The tested varieties were Premium Crop, Universal, Centauro, Sakura and Beejo Sheetal. The highest marketable head yield was from variety Premium Crop (12.01 t/ha) followed by Centauro (11.42 t/ha), while Beejo Sheetal and Universal produced 8.92 t/ha and 8.56 t/ha, respectively. Similarly, in case of plant height, Premium Crop (53.02cm) was the tallest plant and the Universal (36.39cm) was the shortest. Higher plant spreading was recorded from Centauro (71.53cm) and Premium Crop (69.98cm). Terminal head weight was recorded highest for Centauro, followed by Bejo Sheetal and Premium Crop with 0.348 kg, 0.345 kg and 0.325 kg respectively. Considering all of these parameters, varieties Premium Crop and Centauro were found superior over rest of the varieties for summer season production.

Key words: Broccoli, off-season, variety

INTRODUCTION

Broccoli is highly nutritious vegetable among cole crop group. The word broccoli means 'little sprouts' in Italian. It is believed to be the first of the cole crops to evolve from wild cabbage (Delahaut and Newenhouse, 1997). It is rich in vitamin A, C and minerals. The green buds and thick fleshy stalk are used as vegetable. This vegetable is also tastier than cauliflower and cabbage. Its market price is always two times higher than cauliflower and cabbage even in normal (winter) season. There are two types of broccoli available in market- green heads (also called Calabrese in European Country) and purple types. Purple types are grown in limited scale in England. Despite, its high nutrition and monitory value very few formal studies have been carried out in Nepal.

Table 1: Vitamin contents of cole crops (mg/100g of edible portion).

Vegetables	Vit A	Vit B_1	Vit C
Cabbage	400	27	100
Cauliflower	70	56	75
Broccoli	9000	33	137

Source: Brown and Hutchison (1949) as cited by Chatterjee (1986).

Variety plays an important role in production ultimately on farm income. It is very necessary to test the varieties incoming to our country especially when huge numbers of hybrid vegetable seeds are being imported (Subedi and KC, 2004). Hybrids are generally heat tolerant and they do well in summer season. Therefore, with the purpose of varietal testing of broccoli for summer season, this study has been carried out at Pakhribas.

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MATERIALS AND METHODS

The experiment was carried out in two consecutive years 2002/03 and 2003/04 at Pakhribas. There were six varieties namely; Green Sprouting, Premium Crop, Universal, Centauro, Sakura and Beejo Sheetal. Experiment was laid out in RCBD and each treatment was replicated three times. In the year 2002/03 the local check variety Green Sprouting did not germinate and in the year 2003/04 seed of this variety was not found in the market. Seed sowing was done in February under polythene tunnel and planting was done at the seedling age of 51 days. DDVP (76% EC) and Metacid were sprayed to control aphid, flea beetle and cabbage butterfly. The cultural practices like gap filling, irrigation, weeding was done as per the requirement in crop growing period. Fertilizer NPK @ 100: 60:50 kg/ha and FYM @ 10 t/ha were applied. Seedlings were transplanted at the spacing of 60cm x 45cm. Finally data analysis was done by using GENSTAT computer package.

RESULT AND DISCUSSION

Marketable yield (t/ha)

The marketable yield (t/ha) was found significantly different among different varieties (P>.001). The highest yield was obtained from Premium Crop variety (12.01 t/ha) (Table 2). This variety produced significantly highest yield compared to all other varieties except variety Centauro (11.42 t/ha), which produced the second highest yield. The lowest yield of 8.56 t/ha was produced from variety Universal. All of these varieties are F1 hybrids. Local check (OP) variety Green Sprouting did not germinate, due to which this variety could not be included in the comparison.

Table 2: Marketable yield of broccoli varieties.

Varieties	Marketable yield (t/ha)
Beejo Sheetal	8.92c
Centauro	11.42ab
Premium Crop	12.01a
Sakura	10.16bc
Universal	8.56c
F value	>.001
LSD	1.652
CV%	13.2

Figures within column indicated by same letters are not significantly different at 5% level.

The yield of broccoli averaged from 5-10 t/ha. According to Strange *et al.* (1996) average yield of broccoli in California is 16.8 t/ha^{-1}, while Peet (1995) reported 7.4 to 10 t/ha in South America and Stirling (2006) reported 5.4 to 10.9 t/ha yield in Australia. Similarly, Kahn (2002) reported 10.04 t/ha yields for Variety Premium Crop in Oklahoma. Our result also falls within the yield range reported by different scientists.

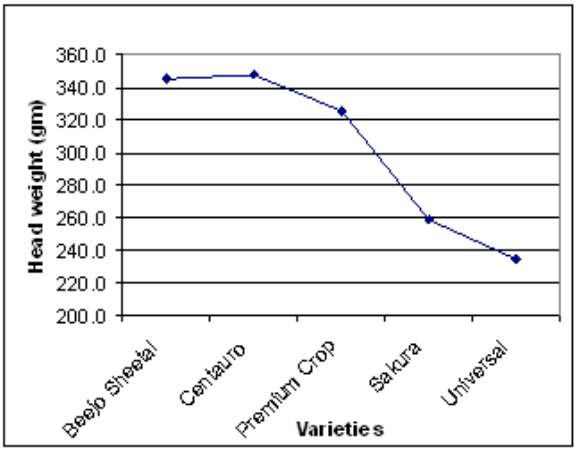

Fig.1: Performance of broccoli varieties on average head weight

Terminal head weight

Head weight was significantly different at 5% level among varieties. This showed that Centauro variety produced highest head weight (348 gm), which was followed by Beejo Sheetal (345 gm). This result indicated that Centauro produced bulky head at first harvest. Premium Crop, Sakura and Universal produced smaller sized heads with 325 gm, 259 gm and 234.gm respectively (fig.1). Stirling (2006) reported that average marketable head weight of broccoli ranged from 207.5 gm to 310.8 gm. Similarly, according to Chatterjee (1986) the average head may be 25 gm to 600 gm. Kahn (2002) found 272 gm of average head weight for variety Premium Crop, the head weight was found exceeded by the result of our experiment.

Table 3: Height of broccoli plants

Varieties	Plant height (cm)
Beejo Sheetal	47.31b
Centauro	48.07b
Premium Crop	53.02a
Sakura	44.79b
Universal	36.39c
F value	>. 001
LSD	4.205
CV%	7.5

Figures within column indicated by same letters are not significantly different at 5% level.

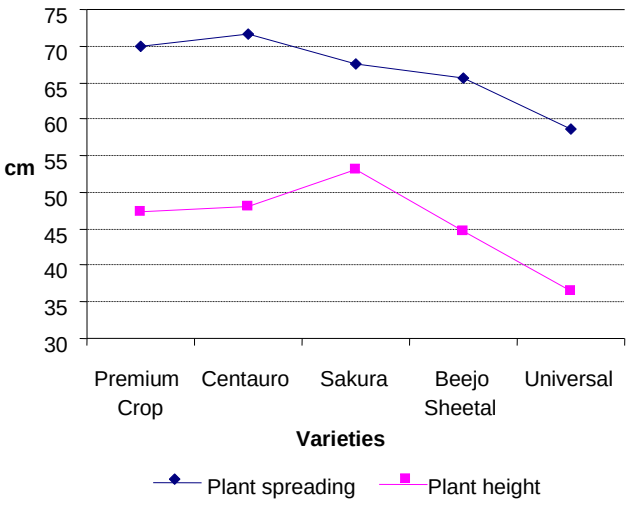

Fig.2: Spreading and height of broccoli plants

Plant height

Plant height was obtained statistically highly significant among the varieties (Table 3). The tallest plant height was recorded from variety Premium crop (53.02cm). This variety was found significantly tallest than rest of the varieties (Fig.2). Varieites Centauro, Beejo Sheetal and Sakura were recorded at par with respect to plant height with 48.07cm, 47.31cm and 44.79cm respectively (Table 3). Shortest plant height was recorded for Universal variety (36.39cm).

Plant spreading

The response of plant spreading due to varieties was found highly significant (P>.001). Centauro variety was observed as the highest spreading plant (71.53cm). Centauro was significantly different from all other varieties except Premium Crop (69.98cm). Premium Crop also differed from Beejo Sheetal and Universal varieties.

Head depth

Different hybrid varieties were found statistically significant (P>0.005) with regards to head depth. Highest head depth was recorded from Premium Crop (13.14cm), which was followed by Centauro (12.84cm). Sakura and Beejo Sheetal were having 11.27cm and 10.94cm head depth respectively.

Head diameter

Centauro variety was recorded to have the highest head diameter (14.59cm). While varieties Premium Crop, Beejo Sheetal and Sakura were observed as statistically at par

with 13.64cm, 13.32cm and 3.04cm diameter respectively. Variety Universal produced smallest head diameter (11.94cm). According to Chatterjee (1986) the terminal head may be 15 – 25 gm in diameter.

First harvesting days

Maturity days due to varieties were recorded significantly different. The observation was taken from the planting to first harvesting. Premium Crop was found earliest in harvesting (55 days). Sakura, Centauro and Beejo Sheetal varieties were harvested in 57 days, 61 days and 64 days respectively. According to Peet (1995) broccoli generally matures in 45 to 60 days after transplanting, which varied depending on the time of year and the variety planted (fig.3).

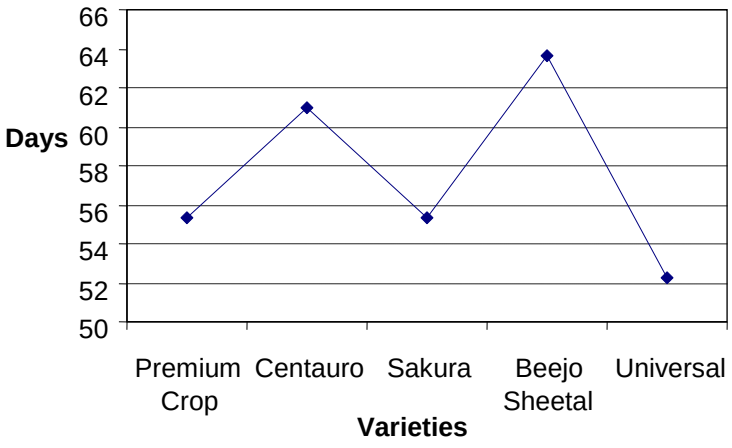

Fig.3: Days of first harvesting

Total number of harvesting per plant

The observation was also made on total number of harvesting. Broccoli also produce small heads from axillary shoots after main one is removed, which are also called as spears. Side shoots found ready to harvest in 9-10 days after previous harvesting. This was found highly significant due to varieties and significant to interaction of variety and year. Premium Crop variety was recorded to have the highest number of harvesting (3.75) during its growing period in the second year of experimentation. This variety was also found to have the highest number of harvesting in first year (2.44). This result demonstrates that Premium Crop variety gives maximum number of harvesting. Side shoots averaged between 45 to 136 gm. Garrison (1985) reported an average of 13 side shoots per plant in variety Premium Crop. A paper also reported that 2-3 more commercial harvests are possible, if the field is properly maintained. These reports are in agreement with our result.

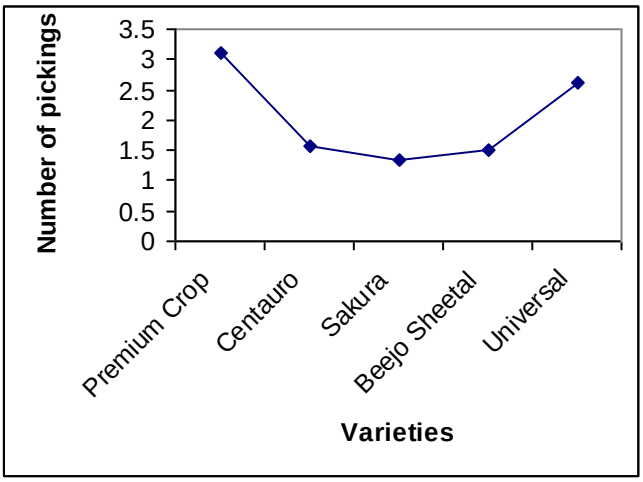

Fig. 4: Total number of harvesting

Problems of summer season broccoli production

Aphids (*Brevicoryne brassicae*) and cabbage butterfly (*Pieris brassicae*) were found as the most problematic insects for broccoli production in summer season. Next important problem of summer broccoli production was yellowing of heads in storage. Over maturity at harvesting, higher storage temperature and/or exposure to ethylene are the major reasons of broccoli cluster yellowing (Cantwell and Sustow, 2000). As broccoli is sensitive to

ethylene, it should not be stored with other products which produce ethylene (tomato, apple etc.). To reduce the yellowing, heads must be cooled with water, ice whatever is available immediately after harvesting (Strange *et al.*, 1996).

CONCLUSION

Based on the two years experimental result, it can be concluded that broccoli can be produced in summer season by using the hybrid varieties. Varieties Premium Crop and Centauro were found superior over other varieties in terms of yield (12.01 t/ha and 11.4 t/ha respectively). While considering bulky head, varieties Centauro, Premium Crop and Beejo Sheetal (347.8 gm, 325 gm and 345.3 gm respectively) were found better as compared to others. In conclusion, varieties Premium Crop and Centauro can be recommended for off-season production.

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