Evaluation of Vegetable Type Cowpea Varieties for Commercial Production in the River Basin and Low Hill Areas

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ABSTRACT

Five vegetable type cowpea varieties were evaluated in farmer's field with farmers participation at Chambas, Tanahu (450 masl) in two consecutive years 2003 and 2004 rainy season to identify suitable vegetable type cowpea varieties for commercial production in the river basin and low hill areas of western region. The experiment was arranged in randomized complete block design (RCBD) with 5 replications, farmer as replication. Prakash variety used as the check was earliest in flowering and days to first harvest from sowing with an average of 37 and 45 days respectively. Pod diameter and pod length among the varieties was significantly different. The biggest sized and longest pods were produced by IT 86F-2062-5 (Green) with an average of 0.990 cm in diameter and 25.60 cm in length. The highest green pod yield (4.971 t/ha) was produced by IT 86F-2062-5 (Green). Despite the earliness in flowering, fruiting and harvesting, Prakash produced the smallest (0.668 cm) and shortest (16.21 cm) pods and ultimately the lowest yield (2.443 t/ha). IT 86F-2062-5 (Green) produced the biggest size (0.990 cm diameter) and longest (24.60 cm) green pods as compared to other varieties IT 86D-792, IT 86F-2062-5 (White), IT 86D-798 and Prakash with white color, small size and fibrous pods. The results of the experiment and farmers preferences revealed that the variety IT 86F-2062-5 (Green) could be recommended for commercial production in the river basin and low hill areas of western region.

Key words: Cowpea, green pods, river basin, variety, vegetable

INTRODUCTION

Cowpea (*Vigna unguiculata*) is one of the important vegetable crops of Nepal. It is grown throughout Nepal for its green pods as vegetable, seeds as pulse and foliage as fodder and sometimes restoring the soil fertility. Cowpea is warm season crop and thrives best between 21-35^0 C (Chakraborty 1997). In Nepal, cowpea can be grown successfully both in spring-summer and rainy-autumn seasons in the plains and hills. Different cultivars respond differently to temperature and day length and thus there are distinct cultivars for spring-summer and rainy seasons (Chakraborty 1997). In general, cowpea is grown in the plains and Tarai areas during summer season and it is grown in the hills during rainy season and harvested in autumn season. Local varieties grown in the hills are long duration (more than 120 days), indeterminate in growth with long harvesting period (more than 45 days). Local and exotic varieties grown in the plains are both determinate and indeterminate in growth, short duration (60-80 days) and short growing and harvesting period. With the advancement of new technologies and development of new varieties, both determinate and indeterminate cowpea varieties are available for longer season of the year in the plains and Tarai of Nepal. Most vegetables crops can successfully be grown from Tarai to the high hills in normal and off-season provided appropriate varieties and technologies for production (Pandey and Pokhrel 2000).

There are mainly two types of cowpeas growing in Nepal for grain and vegetable purposes. Generally grain type cowpea varieties produce short pods with more number of seeds and mature early whereas vegetable type varieties produce long pods with less number of seeds and mature late and the pods remain tender and soft for longer period. Cowpea varieties with long pods and indeterminate in growth

habit are generally known as '*Tane bodi*' and these all are vegetable type. However, with the development of new varieties, vegetable type cowpeas both determinate and indeterminate in growth habit are available in Nepal. Cowpea is generally grown in marginal land with little or no inputs and therefore the yield is very low. Formal research on vegetable type cowpea is very limited and estimation of area and production of this type cowpea is still not recorded. However, National Grain Legumes Research Program (NGLRP), Rampur, Nepal has reported that cowpea occupies 6000 ha and produces 3660 tons of grains with the productivity of 610 kg/ha. National Grain Legumes Research Program has reported that IT 86D-792 produced significantly highest mean yield of 1205 kg/ha grain yield as compared to Aakash (971 kg/ha) and Prakash (917 kg/ha). Average 100 seed weight of IT 86D-792 is higher (16.87 g) as compared to IT 82D-787, Aakash and Prakash. It is also reported that IT 86D-792 is comparatively suitable for vegetable purpose (NGLRP 2000).

Since staking has been scarce in peri-urban areas, cultivation of vegetable type cowpea varieties like *Sarlahi Tane,* a popular variety in Nepal, on a large scale is difficult due to its indeterminate growth habit which necessitated staking for good yield. Therefore, farmers needed a determinate vegetable type variety that could produce pods earlier than *Sarlahi Tane*. National Grain Legumes Research Program had already released '*Prakash*' variety for grain purpose but later it gained popularity for fresh vegetable purposes because of its earliness and determinate growth habit. However, it could not replace indeterminate vegetable type cowpea *Sarlahi Tane* because of its fibrous pods (Bhattarai and Subedi 1996). Generally cowpea is grown from Tarai to mid hills (NGLRP 2000), river basin and low hill areas (below 500 masl) are the potential areas for cowpea production. The objective of the experiment was to select and recommend the suitable varieties for vegetable purpose.

MATERIALS AND METHODS

The experiment was conducted at outreach research site Chambas, Tanahu (450 masl) of Regional Agricultural Research Station, Lumle during the rainy season of two consecutive years 2003 and 2004. The experiment was arranged in a randomized complete block design (RCBD) with 5 replications, farmer as a replication. Five cowpea varieties namely IT 86D-792, IT 86D-798, IT 86F-2062-5 (Green), IT 86F-2062-5 (White) and Prakash were included in the experiment. The experiment was conducted in rainfed upland condition immediately after upland rice harvesting. The individual plot size of the experiment was 50 m^2 (10- × 5-m) with one raised bed per plot. Plant spacing was maintained 50- × 30-cm. The crop was sown on 25 August 2003 and 28 August 2004 and started harvesting 44 days after sowing and ended 74 days after sowing. Compost 10 tons and NPK 20:40:20 kg/ha was applied as basal dose during field preparation. Insecticide (Nuvan) was sprayed (1 ml/liter water) twice (40 and 55 days after sowing) against fruit borer and aphid. The observations on days to flowering, days to first harvest, days to last harvest, number of clusters/plant, number of pods/cluster, pod length, pod diameter and marketable fresh pod yield were collected and statistically analyzed using Genstat computer software. Twenty percent of the total plant population (75 plants/plot) was tagged after plant establishment and data were collected from these plants for clusters/plant, pods/cluster, pod diameter and pod length. The pod diameter was recorded by Vernier Callipers. Farmer's field day was organized where more than 40 farmers participated and evaluated for preference ranking of the varieties.

RESULTS AND DISCUSSION

Days to flowering from sowing

The major objective of this observation was to study the earliness character of the varieties. The difference among the varieties on days to flowering from sowing was significant (Table 1). Prakash took the shortest period (37 days) from sowing to flowering in the first and second year. IT 86F-2062-5 (White) and IT 86D-798 took the longest period (44 days) from sowing to flowering. NGLRP (2000)

reported that Prakash was the earliest in flowering (40 days) and the cowpea varieties flowered earlier (43 days) at Rampur than Surkhet (51 days) and Nepalgunj (52 days). The difference in flowering days might be due to the varietal character, sowing time and growing environment.

Days to first harvest from sowing

The major objective was to study the earliness character of the varieties. The difference among the varieties on days to first harvest from sowing was highly significant (Table 1). Prakash took the shortest period (44 days in 2003 and 45 days in 2004) from sowing to first harvest whereas IT 86F-2062-5 (White) took the longest period (61 days). Earliness plays important role on fetching higher market price and more income. Even a single day plays important role for market price in vegetables. Bhattarai and Subedi (1996) conducted cowpea varietal experiment at Mallajh (1000 masl) and reported that Prakash was the earliest in harvesting (51 days). The difference in harvesting days might be due to the varietal character, sowing time and growing environment.

Table 1. Performance of cowpea varieties on flowering days, first harvest and last harvest days from sowing at Chambas, Tanahu during 2003 and 2004

Variety	Days to flowering from sowing			Days to first harvest from sowing			Days to last harvest from sowing		
	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean
IT 86D-792	38	38	38	50	51	50	72	72	72
IT 86F-2062-5 (Green)	40	39	40	56	56	56	70	70	70
IT 86F-2062-5 (White)	44	45	44	61	61	61	74	74	74
IT 86D-798	44	44	44	59	60	60	74	74	74
Prakash	37	37	37	45	44	45	70	71	71
Mean	41	41	41	54	54	54	72	72	72
P value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
LSD (0.05)	1.01	0.78	0.56	0.80	0.88	0.59	0.96	0.80	0.58
CV, %	1.8	1.4	1.5	1.1	1.2	1.2	1.0	0.8	0.9

Days to last harvest from sowing

The major objective was to study the harvesting period and frequency of harvesting of the varieties. The difference among the varieties on days to last harvest from sowing was highly significant (Table 1). Prakash took the longest harvesting period (26 days) from first harvest to last harvest whereas IT 86F-2062-5 (White) took the shortest harvesting period (13 days) from first harvest to last harvest. Harvesting period and frequency play important role on higher production, productivity and income. Determinate varieties have short harvesting period and less picking frequency as compared to indeterminate varieties. Bhattarai and Subedi (1996) reported in the experimental result that determinate variety (Prakash) has short period than indeterminate variety (Sarlahi Tane).

Number of clusters per plant

The objective of this observation was to evaluate the varieties for pod setting character and the relation of clusters to the yield. The difference among the varieties on number of clusters/plant was significant (Table 2). The highest number of clusters (7.80 in 2003 and 8.04 in 2004 with the mean of 7.92) was produced by IT 86F-2062-5 (White) whereas the lowest number of clusters (5.43 in 2003 and 5.51 in 2004 with the mean of 5.43) was produced by IT 86F-2062-5 (Green). It is one of the major criteria to select better variety for its higher yield and preferable pod size. In general, cluster numbers directly influences the fruit yield, but the results of the experiment showed that it is not the only determinant factor whereas pod length and size also play important role on yield.

Number of pods per cluster

The objective of this observation was to evaluate the varieties for pod setting character and effect of the pod size and number to the yield. The difference among the varieties on number of pods/cluster was non-significant (Table 2). However, the highest number of pods (4.77 pods/cluster) was produced by IT 86D-792. It is one of the major criteria to select better variety for its higher yield and preferable pod size. In general, higher the number of pods/cluster more pod yield is obtained but the results of the experiment showed that fruit size (length and diameter) is also determining factor for yield estimation.

Table 2. Performance of cowpea varieties on clusters/plant, pods/cluster and pod length at Chambas, Tanahu during 2003 and 2004

Variety	Number of cluster/plant			Number of pods/cluster			Pod length, cm		
	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean
IT 86D-792	6.90	7.01	6.96	4.58	4.95	4.77	16.74	16.99	16.87
IT 86F-2062-5 (Green)	5.35	5.51	5.43	4.55	4.62	4.58	25.40	25.80	25.60
IT 86F-2062-5 (White)	7.80	8.04	7.92	4.50	4.62	4.56	17.25	17.63	17.44
IT 86D-798	7.48	7.54	7.51	4.50	4.69	4.60	17.28	17.63	17.46
Prakash	6.13	6.61	6.37	4.50	4.59	4.55	16.20	16.22	16.21
Mean	6.73	6.94	6.84	4.53	4.70	4.61	18.57	18.86	18.71
P value	< .001	< .001	< .001	0.901	0.010	0.065	< .001	< .001	< .001
LSD (0.05)	0.32	0.27	0.22	0.22	0.20	0.16	0.38	0.31	0.26
CV, %	3.5	2.9	3.6	3.6	3.2	3.9	1.5	1.2	1.6

Pod length

The objective of this observation was to evaluate the varieties for pod length and its effect to the pod yield. The difference among the varieties on pod length was highly significant (Table 2). IT 86F-2062-5 (Green) produced the longest pods (25.40 cm and 25.80 cm in 2003 and 2004 respectively with the mean 25.60 cm) whereas Prakash produced the shortest pods (16.21 cm). The pod length of IT 86D-798, IT 56F-2062-5 (White) and IT 86D-798 was 17.46, 17.44 and 16.87 cm respectively. It is one of the major criteria to select better variety for its higher yield and preferable pod size. Longer pods are the preferred and market appealing character of cowpea. It is obvious that the longer pods produce more yield than short pods.

Pod diameter

The objective of this observation was to evaluate the varieties for pod diameter and its effect to the pod yield. The difference among the varieties on pod diameter was highly significant (Table 3). IT 86F-2062-5 (Green) produced the biggest size pods with an average of 0.990 cm in diameter whereas Prakash produced the smallest size pods with an average of 0.668 cm in diameter. T). The pod size of IT 86D-792, IT 86D-798 and IT 56F-2062-5 (White) was 0.790, 0.773 and 0.756 cm respectively. It is one of the major criteria to select better variety for its higher yield and preferable pod size. Bigger and longer green pods are the preferred and market appealing characters of cowpea. In general, bigger and longer the pod size, higher yield is obtained. Pod size is the major determining factor for yield estimation. The results revealed that the green pod yield is directly related to the pod size (length and diameter). The variety that produced the longest and biggest size pods, highest green pod yield was recorded.

Table 3. Performance of cowpea varieties on pod diameter and fresh pod yield at Chambas, Tanahu during 2003 and 2004

Variety	Pod diameter, cm			Fresh pod yield, t/ha		
	2003	2004	Mean	2003	2004	Mean
IT 86D-792	0.788	0.791	0.790	3.518	3.693	3.605
IT 86F-2062-5 (Green)	0.985	0.994	0.990	4.845	5.098	4.971
IT 86F-2062-5 (White)	0.750	0.762	0.756	3.743	3.882	3.813
IT 86D-798	0.773	0.772	0.773	3.710	3.730	3.720
Prakash	0.663	0.672	0.668	2.438	2.449	2.443
Mean	0.792	0.798	0.795	3.651	3.770	3.711
P value	< .001	< .001	< .001	< .001	< .001	< .001
LSD (0.05)	0.03	0.01	0.01	0.04	0.14	0.10
CV, %	2.8	0.7	1.9	0.8	2.8	3.0

Marketable fresh pod yield

Marketable fresh pod yield is the major determinant variable for selecting a particular variety for its commercialization and income generation capability. The difference among the varieties on marketable

fresh pod yield was highly significant (Table 3). IT 86F-2062-5 (Green) produced the highest marketable fresh pod yield of 4.971 t/ha. Similarly, IT 86F-2062-5 (White) produced 3.813 t/ha and Prakash produced the lowest yield (2.443 t/ha). IT 86D-798 and IT 86D-792 produced fresh pod yield 3.720 and 3.605 t/ha respectively. Bhattarai and Subedi (1996) reported that Sarlahi Tane produced the higher pod yield than Prakash. NGLRP reported that all tested varieties produced higher grain yield than Prakash at Rampur, Nepal. NGLRP, Rampur conducted CVT in different locations and found that IT 86D-792 produced the highest grain yield (1205 kg/ha). Prakash variety was found to be the earliest variety for flowering, pod setting and harvesting. Among the yield determinant parameters such as number of clusters/plant, pods/cluster, pod length and pod diameter, only one character was not found as the determinant character for yield estimation. However, combination of pod length and diameter directly influenced the pod yield. Despite the earliness in character, farmers did not like Prakash due to its fibrous, small and short pod characters. Farmers during field visit in Farmers' field day mentioned that the preference characters for cowpea are earliness, staking support, yield, pod color, pod length, pod size, eating quality (fiber content) and appearance. Based on the preferred characters, farmers ranked the varieties first to last IT 86F-2062-5 (Green), IT 86D-792, IT 86F-2062-5 (White), IT 86D-798 and Prakash.

Farmers preferred green color, big and long size with tender and fibreless pods for home consumption and also consumer's preferred characters for the market. The average production cost and income of cowpea was calculated NRs 40,000 and 100,000/ha respectively with net profit NRs 60,000/ha. Because of all positive characters, farmers preferred IT 86F-2062-5 (Green) for commercial production. Therefore, this variety could be recommended for river basin and low hill areas for commercial production.

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