EVALUATION OF ASPARAGUS BEAN (*Vigna unguiculata* sub sp. sesquipedalis L. VARIETIES UNDER MID-HILL CONDITION OF DAILEKH, NEPAL

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ABSTRACT

An experiment was conducted with seven asparagus bean varieties including 'Khumal Tane' (standard check) for the selection of superior genotype during two consecutive years 2012 and 2013 at Horticultural Research Station (HRS), Dailekh in autumn-winter season. The results showed that average plant height differed from 2.16 m to 2.64 m, number of pod varied from 12.11 to 17.50 per plant, individual pod weight ranged from 13.41 g to 21.49 g, pod length ranged from 35.07 to 64.47 cm, pod diameter differed from 7.86 mm to 8.38 mm, days to first flowering and harvesting varied from 35.17 to 42.17 and 52.5 to 61.00 days respectively and pod yield ranged from 14.21 mt to 28.99 mt/ha. The results revealed that major yield parameters of the variety 'HRDASB-001' was superior and desirable with 28.99 mt/ha green pod yield and, hence, could be recommended for extension of cultivation in the mid-hill regions of Nepal having the similar climatic tract of Dailekh district.

Key words: Vigna unguiculata subsp. Sesquipedalis L., vegetable type, Khumal Tane, pod length and pod weight

INTRODUCTION

Cowpea (Vigna unguiculata L.) is one of the most important food legumes which serve as vital source of protein in the diet of the people of developing countries. It is widely grown in the third world for its cheap source of dietary protein (Ibrahim et al., 2010). Cowpea has considerable adaptation to high temperatures and drought compared to other crop species but is intolerant of frost. Cowpea is usually better adapted to drought, high temperatures and other biotic stresses than other crop plant species (Hall, 2004). It is primarily grown in drier regions of the world where it is one of the most drought-resistant food legumes (Dadson et al., 2005). Some differences exist between vegetable cowpea and grain types for their vegetative characteristics, physiological characteristics and green pod yield (Gani et al., 2003). Generally, grain type cowpea varieties produce short pods with more number of seeds and mature earlier, while vegetable type varieties are grown for their immature long succulent pods with less number of seeds, maturing late and the pods remaining tender and soft for longer period (Pandey et al., 2006).

Asparagus beans (Vigna unguiculata subsp. Sesquipedalis L.) are important leguminous vegetable crops of tropical and sub-tropical regions and are believed to have been selected in South-East Asia from India. Asparagus beans are selected and developed from vegetable type cowpea (V. ungiculata L.) for their longer and tender pods (Steele and Mehra, 1980). Asparagus beans are popularly known by different names: string bean, long podded cowpea, snake bean, Chinese long bean, pea bean, etc. In Philippines, it is popular by its name 'poor man's meat'. Commercial cultivation is primarily found in Indonesia, Thailand, Taiwan and China (Rachie, 1985). However, it is cultivated as minor vegetable crop in many Asian and other countries of the world.

In Nepal, asparagus beans are gaining popularity in the recent years. Its area is increasing annually because of its commercial value and higher yield. It is cultivated in 2,993 ha with total production and productivity 32,507 mt and 10.90 mt/ha, respectively (MOAD, 2013). Productivity of asparagus bean is much lower in Nepal due to the

unavailability of quality seed and poor management of crop. Therefore, this study was conducted to select the superior varieties with complete package of practices.

METHODOLOGY

Seven varieties of asparagus bean, namely, 'HRDASB-001', 'HRDASB-002', 'HRDASB-003', 'HRDASB-004', 'HRDASB-005', 'HRDASB-006' and 'Khumal Tane' as standard check, were evaluated at HRS, Dailekh, during two consecutive years 2012 and 2013 for green pod production. Seeds were planted in second week of August in 4.50 m2 experimental area at 50×30 cm spacing containing 30 hills (2 seed per hill) per plot. Treatments were replicated three times. Fertilizers and manure were applied @ 80:120:40 kg NPK/ha and 12 mt/ha respectively. Crop protection measures were done as per the recommendations. Observed data were analyzed using the MSTAT-C package, where means were separated by DMRT.

RESULTS AND DISCUSSION

Plant height

Though all the seven varieties were tall and pole type, degree of tallness varied to some extent. In the first year of study, the height was significantly higher in 'HRDASB-006' (2.59 m) followed by 'HRDASB-001' (2.55 m), 'HRDASB-002' (2.53 m) and the shortest height was found in 'Khumal Tane'. In the second year, 'HRDASB-001' exhibited the maximum height (2.72 m) followed by 'HRDASB-005' (2.70 m) and 'Khumal Tane' placed at the same position. The average performance of different varieties on height was different. 'HRDASB-001', 'HRDASB-002', 'HRDASB-003', 'HRDASB-005', 'HRDASB-006' were statistically at par. 'HRDASB-004' was placed second position before 'Khumal Tane' which was the shortest in height (2.26 m) (Table 1).

Table 1. Performance of different asparagus bean varieties to plant height during 2012 and 2013 at HRS, Dailekh

Variety	Plant height (m)		
	2012	2013	Average
HRDASB-001	2.55^{a}	2.72^{a}	2.64^{a}
HRDASB-002	2.53^{a}	2.57^{ab}	2.55^{a}
HRDASB-003	2.47^{ab}	2.60^{a}	2.54^{a}
HRDASB-004	2.34^{b}	2.41^{b}	2.38^{b}
HRDASB-005	2.52^{a}	2.70^{a}	2.61^{a}
HRDASB-006	2.59^{a}	2.60^{a}	2.65^{a}
Khumal Tane	2.10^{c}	2.22^{c}	2.16^{c}
GM	2.44	2.56	2.50
F value	14.27*	13.40**	17.85**
CV (%)	3.18	3.41	2.88
CD (P≤0.05)	0.14	0.16	0.13

Number of pod per plant

Number of pod per plant affects the total yield. Among the tested varieties this parameter was statistically non-significant and varied from 12.53 in 'HRDASB-006' to 16.11 in 'HRDASB-001' and 'Khumal Tane' in 2012. In 2013 also, the difference in number of pods per plant was non-significant and varied from 11.68 in 'HRDASB-005'

to 18.89 in 'HRDASB-001'. Likewise, the difference among the average number of pods per plant of the two years was non-significant and differed from 12.11 in 'HRDASB-005' to 17.50 in 'HRDASB-001' with a grand mean value of 15.21 (Table 2).

Table 2. Performance of asparagus bean varieties in terms of number and individual weight of pod during 2012 and 2013 at HRS, Dailekh

Variety	Number of pod per plant			Individual pod weight (g)		
	2012	2013	Average	2012	2013	Average
HRDASB-001	16.11	18.89	17.50	20.94[a]	22.03[a]	21.49[a]
HRDASB-002	15.45	16.10	15.78	17.57[ab]	17.29[bc]	17.43[c]
HRDASB-003	14.95	15.05	15.81	18.70[ab]	17.89[bc]	18.30[bc]
HRDASB-004	14.85	15.10	14.68	18.57[ab]	19.28[a-c]	18.93[bc]
HRDASB-005	14.26	11.68	12.11	18.94[ab]	20.89[ab]	19.91[ab]
HRDASB-006	12.53	15.57	15.26	14.22[ab]	13.66[d]	13.94[d]
Khumal Tane	16.11	15.86	15.36	10.92[b]	15.91[cd]	13.41[d]
GM	14.96	15.46	15.21	17.12	18.14	17.63
F value	0.36 NS	2.55 NS	1.29 NS	13.3252*	6.96**	30.15**
CV (%)	25.47	14.84	16.31	9.43	10.43	5.35
CD (P≤0.05)	6.779	4.082	4.414	7.36	3.364	1.678

Individual pod weight

Weight of individual pod varied significantly both in first and second year of the study. In pooled data also, the difference was highly significant. In the 1st year, the maximum weight of individual pod was found in 'HRDASB-001' (20.94 g) followed by 'HRDASB-005' (18.94 g) and 'HRDASB-003' (18.70 g) and the minimum pod weight was found in 'Khumal Tane' (10.92 g). In the second year, 'HRDASB-001' gave 22.03 g weight and was statistically at par with 'HRDASB-005' (20.89 g) and 'HRDASB-004' (19.28 g). In pooled data, 'HRDASB-001' gave the maximum pod weight (21.49 g) with which 'HRDASB-005' was statistically at par. 'HRDASB-006' and 'Khumal Tane' produced lighter fruit weight (Table 2).

Above result was higher and different from Kamala et. al., 2014, who reported that among the 39 collected asparagus bean gremplasms studied the individual pod weight varied from 6.00 g to 14.00 g.

Pod length

Pod length of seven varieties varied significantly. In 2012, the highest length of pod was observed in 'HRDASB-001' (66.97 cm) followed by 'HRDASB-003' (59.21 cm) and the shortest pod length was recorded in 'HRDASB-006'. Similarly, in 2013, the highest length was again produced by 'HRDASB-001' (61.97 cm) followed by 'HRDASB-003' (54.79 cm) both being at par. The length of pod was observed minimum in 'HRDASB-006'. The pooled data showed that significantly the longest pod was produced by 'HRDASB-001' (64.47 cm) followed by 'HRDASB-003' (57.00 cm) and the shortest by 'HRDASB-006' (35.07 cm) (Table 3).

Pod diameter

Pod diameter did not differ significantly in both the years. In 2012, the diameter varied from 7.97 mm in 'HRDASB-003' to 8.37 mm in 'HRDASB-005' and 'HRDASB-006' with mean value 8.22 mm. Similarly, in 2013,

diameter ranged from 7.75 mm in 'HRDASB-003' to 8.47 mm in 'HRDASB-002' with mean diameter of 8.13 mm. The average of two years' data indicated that diameter was non-significantly varied from 7.86 mm in 'HRDASB-003' to 8.38 mm in 'HRDASB-002' (Table 3).

Table 3. Performance of asparagus bean varieties in terms of pod length and diameter during 2012 and 2013 at HRS, Dailekh

Variety	Pod length (cm)			Pod diameter (mm)		
	2012	2013	Average	2012	2013	Average
HRDASB-001	66.97[a]	61.97[a]	64.47[a]	8.34	7.97	8.15
HRDASB-002	51.00[d]	49.63[b]	50.32[cd]	8.29	8.47	8.38
HRDASB-003	59.21[b]	54.79[ab]	57.00[b]	7.97	7.75	7.86
HRDASB-004	54.15[c]	50.99[b]	52.57[c]	7.99	7.93	7.96
HRDASB-005	56.31[c]	50.83[b]	53.57[bc]	8.37	8.34	8.35
HRDASB-006	34.57[f]	35.57[c]	35.07[e]	8.37	8.38	8.37
Khumal Tane	45.01[e]	48.93[b]	46.97[d]	8.22	8.04	8.13
GM	52.46	50.38	51.42	8.22	8.13	8.18
F value	124.038**	10.07**	58.99**	1.28 NS	2.09 NS	3.05NS
CV (%)	3.18	8.58	3.99	3.18	3.96	2.23
CD (P≤0.05)	2.883	7.691	3.646	0.46	0.57	0.47

Above result of pod length was also supported by Kamala et. al., 2014, who found the length of collected germplasms varying from 24 cm to 75 cm. However, the diameter was not described by him. Similarly, Lorz and Halsy, 1964 also reported that the length of asparagus bean varied from 45-75 cm long.

Days to first flowering

Days taken to first flowering varied significantly among varieties in both the years. The days to first flowering was significantly short in 'HRDASB-005' followed by 'HRDASB-006' with which 'HRDASB-002', 'HRDASB-003', 'HRDASB-004' were statistically at par. The days to first flowering of 'HRDASB-001' and 'Khumal Tane' were statistically at par in both the years and pooled data. Analyzed result showed that flowering on them was about a week later than other varieties (Table 4).

Days to first harvest

Days taken to first commercial harvest among the tested varieties differed significantly. 'HRDASB-002', 'HRDASB -003', 'HRDASB-004', 'HRDASB-005' and 'HRDASB-006' were ready for harvest within 52-54 days whereas 'Khumal Tane' and 'HRDASB-001' were ready within 60-61 days after sowing of seed (Table 4).

Table 4. Performance of asparagus bean varieties in terms of flowering and harvesting during 2012 and 2013 at HRS, Dailekh

Variety	Days to first flowering			Days to first harvest		
	2012	2013	Average	2012	2013	Average
HRDASB-001	41.67[a]	42.00[a]	41.83[a]	61.33[a]	60.00[a]	60.67[a]
HRDASB-002	34.67[b]	36.00[b]	35.33[b]	52.00[b]	54.33[b]	53.17[b]
HRDASB-003	36.3 [b]	37.00[b]	36.67[b]	53.33[b]	52.33[b]	52.83[b]
HRDASB-004	36.67[b]	36.67[b]	36.67[b]	53.00[b]	52.00[b]	52.50[b]
HRDASB-005	34.33[b]	36.00[b]	35.17[b]	52.33[b]	52.67[b]	52.50[b]
HRDASB-006	34.67[b]	36.33[b]	35.50[b]	52.67[b]	52.67[b]	52.67[b]
Khumal Tane	42.33[a]	42.00[a]	42.17[a]	60.00[a]	62.00[a]	61.00[a]
GM	37.24	38.00	37.62	54.95	55.14	55.05
F value	16.51**	11.17**	20.04**	15.57** 15.57**	21.63**	29.71**
CV (%)	3.86	3.76	3.14	3.15	2.77	2.29
CD (P≤0.05)	2.53	2.54	2.09	3.08	2.71	2.24

Above results was also supported by Kamala et. al., 2014 who reported that first flowering started from 40-45 days and became ready to harvest within 55-60 days after seed sowing based on the climatic condition.

Fresh pod yield

The pod yield is the most important parameter for selection of the asparagus bean varieties. The yield of green pod differed highly significantly among the varieties (Table 5). The highest yield was produced by 'HRDASB-001' (30.40 mt/ha in 2012 and 27.57 mt/ha in 2013) which was about two times higher than 'Khumel Tane', a released variety of Nepal. Other varieties were statistically at par for their yield performances in both the years. The average yield of 'HRDASB-001'(28.99 mt/ha) was significantly the highest and was followed by 'HRDASB-003' (19.25 mt/ha), 'HRDASB-004' (18.68 mt/ha) and 'HRDASB-002' (18.36 mt/ha). The lowest yield was given by 'Khumal Tane' (14.21 mt/ha).

Table 5. Performance of asparagus bean varieties in terms of pod yield during 2012 and 2013 at HRS, Dailekh

Variety	Yield (mt/ha)		
	2012	2013	Average
HRDASB-001	30.40[a]	27.57[a]	28.99[a]
HRDASB-002	18.37[b]	18.35[bc]	18.36[b]
HRDASB-003	20.66[b]	17.84[bc]	19.25[b]
HRDASB-004	18.09[b]	19.28[b]	18.68[b]
HRDASB-005	15.88[b]	16.18[bc]	16.02[b]
HRDASB-006	14.27[b]	14.21[c]	14.24[b]
Khumal Tane	11.49[b]	16.92[bc]	14.21[b]
GM	18.45	18.62	18.54
F value	5.05**	9.44**	10.79**
CV (%)	25.33	12.94	14.38
CD (P≤0.05)	8.314	4.286	4.742

Above result was higher in 'HRDASB-001', but the other varieties produced lower than the yield reported by Kamala et. al., 2014, who reported that yield of green pod was estimated at 25.7 mt/ha.

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