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Adaptation Study of Improved Haricot Beans (Phaseolus Vulgaris L.)Varieties at Western Oromia, Haro Sabu, Ethiopia

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Abstract
The experiment was conducted to identify, select and recommend adaptable, high yielding, Insect pest and disease resistant released variety for major Haricot bean producing areas of west and Kellem Wollega zones of West Oromia. Thirteen varieties were evaluated in RCBD with three replication at Haro sabu Agricultural research centre (HARC) on station for one year 2011/12 main cropping season. Analyses of data revealed significant varietal differences (P< 0.05) in grain yield, days to 50% flowering, days to 95% maturity, seed per pod, pod per plant, hundred seed weight, and for plant height. However, no significant varietal differences were observed in stand count. The replication effect was not significant (P < 0.05) for all characters. ICAP-0056, IBADO and GLP-2 were significantly yielder than the rest and recommended as promising variety under the study area.
Key words: - haricot beans , phaseolus vulgaris L. adaptations, varieties

BACK GROUND AND JUSTIFICATION

The importance of the common bean cannot be overemphasized. Apart from providing the subsistence needs such as food to many people in the world (CIAT, 2004), beans are also sold in local markets and urban areas to provide cash to farmers and traders. They are the leading grain legume crop taking up 30% of the total pulse production and grown on more than 14 million hectares worldwide (Singh, 2001). Of the five domesticated species of *Phaseolus*, the common bean (*P. vulgaris*) is the most widely grown, occupying more than 85% of production area sown to all *Phaseolus* species in the world (Singh, 2001). It is produced primarily in tropical low-income countries, which account for over three quarters of the annual world production. Economic significance of common bean in Ethiopia is quite considerable since it represents one of the major food and cash crops. It is often grown as cash crop by small-scale farmers and used as a major food legume in many parts of the country where it is consumed in different types of traditional dishes (Habtu, 1994). The estimated production area and yield of common bean in Ethiopia in 2012/2013 cropping season were 366,876.94 hectares and 4,630,084.90 quintals, with respective increment of 2.99 % and 2% in area and production, respectively. In addition, the average national yield was reported to be 12.62 q/hec. The largest common bean production areas are found in Oromiya,Benshangul-Gumuz,SNNPR,Tigray and in Amhara regional states (CSA, 2013). Somalia and Gambela regional states also produce a considerable amount of common bean. Production and productivity of common bean is increasing from year to year in western Oromia(CSA, 2013).

In Ethiopia, population is growing in more rate than the agricultural production does. To feed this increasing population the agricultural production should grow accordingly with the same pace or even more. Pulses crops are the most important crops in the national strategy of food self-reliance and foreign exchange earnings. Therefore, to increase the productivity of the farmers, it is crucial to increase the awareness of farmers towards the usage of different improved technologies that increase their production and accelerate food security through proper implementation.

Access to new and improved agricultural technologies is limited in Kellem Wollega and West Wollega zones of Oromia most probably due to remoteness from the center and inaccessibility of improved agricultural technologies in the areas. The potential of pulse crops is not exploited in this part of the region due to lack of improved varieties, poor management practices, biotic factors (weeds, diseases and insect pests etc.), and a biotic factors (soil acidity, high intensity and long duration of rainfall). So far, the national and regional research institutions in the country have released many varieties for commercial Production. However, these technologies did not tested for their adaptability potential under western part of Oromia and did not reach the smallholder farmers living in western parts of Oromia. Therefore, to overcome the above stated problems and to acquaint smallholder farmers with new technologies of widely grown pulse crops production, the well-performed, adaptable and high yielding haricot bean varieties were tested and identified at Haro Sabu Agricultural Research Center on station.

MATERIALS AND METHODS

The experiment was conducted on thirteen **Haricot bean varieties. These varieties were sown on June 10, 2011/12 main cropping season at Haro Sabu Agricultural Research Center on station with an objective of**

identifying, selecting and recommending, adaptable, high yielding and disease resistant /tolerant haricot bean varieties for immediate farmers and farming community of the area. The varieties evaluated under the study include ICAP-0056, IBADO, GLP-2, Loko, M.dima, A.dume, Chore, Canscope, DRK, Awash-1, A.melka and Anger were hosted from Malkasa Agricultural Research Center(MARC)where as the check was from local farmers. Randomized complete block design(RCBD) with three replication were used in this study. . Experimental unit comprised five rows of 3 meters length with row-to-row distance of 40 cm and plant-to-plant distance of 10 cm with application 100 kg/ha of DAP at plating. Yield data and yield component parameters such as stand count at harvesting, plant height, pod per plant, seed per pod, days to flowering, and days to maturity were recorded for respective varieties. Yield collected were adjusted at 14% standard moisture content from harvestable plot while hundred seed were randomly counted and weighted. The data were subjected to statistical analysis using SAS 9.1 computer software. The significance of means differences were tested by Duncan's Newman Multiple Range Test (DNMRT) as stated in Gomez and Gomez (1984).

RESULT AND DISCUSSION

The result of analysis of variance based on randomized complete block design experiment for Haro Sabu Research Center on station presented in Appendices 1. Analyses of data revealed significant varietal differences ($P< 0.05$) in grain yield, days to 50% flowering, days to 95% maturity, seed per pod, pod per plant, hundred seed weight, and for plant height. However, no significant varietal differences observed in stand count. The replication effect was not significant ($P < 0.05$) for all characters.

Table-1. Mean values of yield and yield components of Haricot bean varieties tested at Haro Sabu Agricultural Research Center on station

varieties	YLD	PPS	SPP	SC	HSW	PH	DTF	DTM
ICAP-0056	22.2 ^{a}	*10.2^{ef}*	2.5^{fg}	133.67^{abc}	41.7^{a}	58.533^{b}	48^{c}	91^{b}
Ibado	21.7^{a}	11.867^{def}	2.53^{fg}	135.33 ^{abc}	43^{a}	34.2^{f}	48^{c}	91^{b}
GLP-2	19.5^{ab}	13.8^{bcde}	2.233^{g}	130.33^{abc}	45^{a}	47.6^{cd}	48^{c}	91^{b}
Loko	14.5^{abc}	13.133^{cde}	2.366^{fg}	123.33^{bc}	45^{a}	49.26^{bcd}	48^{c}	91^{b}
M.dima	11.9^{abc}	8.267^{f}	2.733^{defg}	178.33^{a}	40^{a}	34.53^{f}	41^{d}	86^{e}
A.dume	11.5^{cd}	12.467^{cde}	4.2^{ab}	154.7^{ab}	16.7^{c}	51.93^{bc}	48^{c}	88^{d}
Chore	10.8^{abc}	19.133^{ab}	3.73^{bc}	123^{bc}	13.3^{c}	55.86^{bc}	50^{b}	89^{c}
Canscope	10.4^{abcd}	12.4cd^{e}	2.766^{efg}	119.67^{bc}	30^{b}	51.86^{bc}	48^{c}	88^{d}
DRK	9.95^{abcd}	9.33^{ef}	2.366^{fg}	106^{bc}	40^{a}	36.86^{ef}	37^{e}	78^{f}
Awash-1	9.5^{abcd}	18.333^{abc}	3.3^{cde}	131.33^{abc}	13.3^{c}	47.06^{cde}	48^{c}	91^{b}
A.melka	8.8 ^{cd}	19.133^{ab}	3.4^{bcd}	152^{ab}	13.3^{c}	40.4^{def}	53^{a}	91^{b}
Anger	7.4^{cd}	15.733^{bcd}	2.933^{def}	120.67^{bc}	16.7^{c}	40.4^{def}	53^{a}	91^{b}
L.check	5.4^{d}	23.533^{a}	4.966^{a}	122^{bc}	13.3^{c}	71^{a}	53^{a}	93^{a}
CV(%)	9.7	7.4	24.0	10.4	11.8	20.4	9.42	28.3

**Means with the same letter are not significantly different. DTF=Days to 50%flowering, DTM= days to 95%maturity, SPP= number of seed/pod, PPS= number of pod/stand, PH= plant height, SC= stand count at harvesting, HSW= hundred seed weight, YLD=Yield, CV (%) = coefficient of variation in percent*

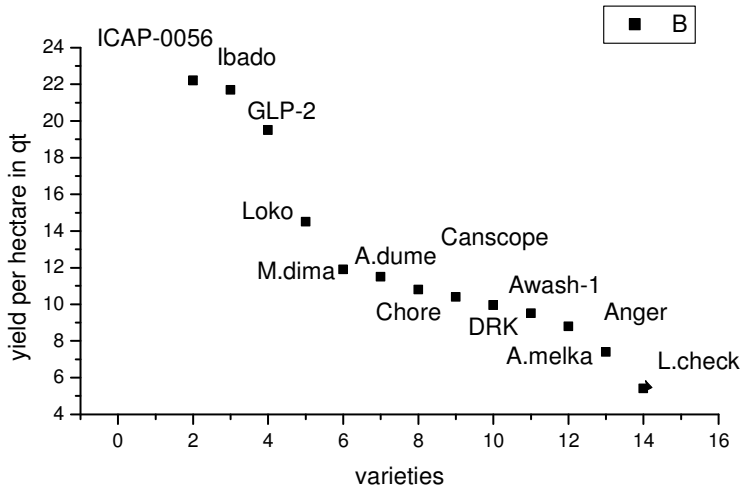

Figure.1.yield response of Haricot bean varieties tested at Haro Sabu Agricultural Research Center on station

Variation in grain yield and other agronomic trait

The maximum yield was obtained from ICAP-0056(22.2 qt h^{-1}), followed by Ibado(21.7 qha^{-1}), and GLP-2(19.5 qha^{-1}). On the contrary, the lowest grain yield obtained from the Local check (5.4$qtha^{-1}$). The high yielding variety ICAP-0056 had a yield advantage of 24.3% compared with that of the Local checks. In addition to that A.dume,A.melka,Anger and Local check were low yielder. The mean value yield of ICAP-0056(22.2.Qt/ha), Ibado (21.7Qt/ha) and GLP-2(19.5Qt/ha) confirm yield range (17-24 Qt/ha) of haricot bean on research station (Crop variety registers issue, 2010).

Chore, Awash-1, A.melka and Local check showed maximum pod number while DRK, M.dima and ICAP-0056 were those who bear fewer pods per plant. In terms of Seed per pod, Local check and A.dume have highest seed per pod while GLP-2, DRK, Loko, ICAP-0056 and Ibado have lowest seed per pod. This reveals that Local check and A.dume as they are small seeded bean type while GLP-2, DRK, Loko, ICAP-0056 and Ibado were large seeded bean type. Moreover, the maximum pod setting per stand of Local check observed in this study was arising from the height of this variety. Following the same trend hundred seed weight for large seeded type were highest while for small seeded type bean were lowest.

In point of view of plant height, Local check significantly differs from the rest of tested varieties to being highest in height. In contrasts M.Dima, Ibado, and DRK were shortest. Even though there is numerical designation difference, there was no significant difference for stand count. However, maximum mean value was observed for M.dima where as minimum value was recorded for DRK. DRK (78 days to maturity) was very early maturing variety, and local check (93 days) was the latest to mature. Depending on their maturity bases these varieties may be grouped as early variety (DRK), intermediate varieties (M.dima, A.dume, Chore and Canscope) and late maturing varieties (local check, ICAP-0056, Ibado, GLP-2, Loko, A.melka,Anger and Awash-1). In the same manner DRK,who is early to mature was also early to flower and the intermediate and late maturing varieties were following the same trend as that of their maturity in terms of their flower.

CONCLUSSION AND RECOMMENDATION

Generally, the present study entails the presence of significant variations among common bean varieties. Results revealed that ICAP-0056(22.2 qt h^{-1}), showed to be best performer variety followed by Ibado(21.7 qha^{-1}), and GLP-2(19.5 qha^{-1}). Hence, if the above-mentioned varieties demonstrated and popularized to the small-scale holder farmers, they can boost the income of poor farmer.

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Appendices

Appendix 1.Mean Squares of yield and yield components of Haricot bean varieties tested at Haro Sabu Agricultural Research Center on station

Source of Variation	Degree of freedom	Mean squares							
		DTF	DTM	SPP	PPS	PH	SC	HSW	YLD
Replication	2	0.0014^{ns}	0.0031^{ns}	0.29^{ns}	13.51^{ns}	32.46^{ns}	124.79^{ns}	0.0044^{ns}	0.169^{ns}
Treatment	12	62.23*	43.92*	2.0*	60.63*	330.9*	1068.63^{ns}	0.06*	0.287 *
Error	24	0.00013	0.00062	12.0	0.75	31.97	736.43	0.001	0.042
SE(+)		47.92	89.15	14.41	8.33	47.73	133.1	0.28	0.72
CV%		9.7	7.4	24.0	10.4	11.8	20.4	9.42	28.3

*ns-= None significant at 0.05 probability level, * = significant 0.05 probability level*
DTF=Days to 50% flowering, DTM= days to 95%maturity, SPP= number of seed/pod, PPS= number of pod/stand, PH= plant height, SC= stand count at harvesting, HSW= hundred seed weight, YLD=Yield, CV (%)= coefficient of variation in percent.

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