

## I. Registration of 'Arjo-1' and 'Bariso' Field Pea (*Pisum sativum* L) Varieties

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**Abstract:** Arjo-1 and Bariso are common names for the field pea (*Pisum sativum* L) varieties with the pedigree names of EH90025-1 and EH90011-1-2 respectively. They were developed and released by Bako Agricultural Research Center for western Ethiopia. Arjo-1 and Bariso were evaluated for six years (1999-2004) at Arjo, Gedo and Shambu stations and had better mean grain yield than the standard check, Tegegnech. Arjo-1 and Bariso were resistant to ascochyta blight and powdery mildew. The result of multi-location trials showed that Arjo-1 and Bariso had above-average grain yield performance across tested locations and years. Yield stability was studied for Arjo-1 and Bariso and they were stable in grain yield performance.

### 1. Agronomic and Morphological Characteristics

In the development of Bariso and Arjo -1, early maturity was considered as an important trait for the reason that locals are very late and seriously attacked by diseases occurring later. The seed of Arjo-1 is more uniform and larger than that of Bariso and the seed of Bariso is whiter in color than that of Arjo-1. A summary of agronomic and morphological characteristics is presented in Appendix I.

### 2. Yield Performance

Arjo-1 and Bariso were developed through hybridization followed by pedigree and bulk selections by Holetta Agricultural Research Center and variety trials by Bako Agricultural Research Center in Ethiopia. Arjo-1 (EH90025-1) is a cross between two parents, Mohanderfer and PS-210794, whereas Bariso (EH90011-1-2) is a cross between EXDZ and PS-210794. The varieties were evaluated with a standard check, Tegegnech and local checks in multi-locations yield trials from 1999 to 2004 at Arjo, Gedo and Shambu. They gave a seed yield ranging from 2.0 to 3.9 tons ha<sup>-1</sup> at research stations and 2.0 and 2.5 tons ha<sup>-1</sup> on farmers' fields. Arjo-1 and Bariso have outperformed the standard check, Tegegnech by 24% and 28% at stations in seed yield respectively. On farm mean grain yield, Arjo-1 and Bariso was 2.0 ton/ha compared to 1.6 ton/ha for the standard check, Tegegnech.

### 3. Stability Performance

Yield stability parameters for nineteen field pea varieties for two years at three locations were calculated based on the method of Eberhart and Russel (1966). The result of the study revealed that Arjo-1 and Bariso had a unity regression coefficient associated with high mean grain yield, implying that they had good general adaptability. Similarly the standard check, Tegegnech, was stable but the local check was not stable.

### 4. Disease reaction

Arjo-1 and Bariso exhibited moderate resistance to the predominant diseases such as ascochyta blight (*Ascochyta pisi*) and powdery mildew (*Erysiphe polygoni*) (Table 1).

### 5. Conclusion

The field pea varieties, Arjo-1 and Bariso, had above-average grain yield performance in all environments outyielding the standard check, Tegegnech and local check. They have a white seed color with better yield stability than the local check. These varieties are moderately resistant to ascochyta blight and powdery mildew and they have, therefore, been released for production in the highlands of Arjo, Gedo and Shambu, and similar agro ecology in western Ethiopia.

### 6. Reference

Eberhart, S.A. and Russel, W.A. 1966. Stability parameters for comparing varieties. *Crop Science* 6:36-40.

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Table 1. Summary of mean grain yield and related aspects of Arjo-1, Bariso and checks across years and locations.

Varieties	DF	DM	PH (cm)	# of PPP	# of SPP	100 swt	Ascoch	P. mildew	Yield (ton/ha)
EH90025-1	64	112	142	9	34	22	4	4	2.5
EH90011-1-2	66	112	120	9	37	20	4	4	2.6
Tegegnech	61	110	133	10	42	19	5	5	2.0
Local check	68	123	145	9	40	14	6	5	1.9

*DF=days to flowering; DM=days to maturity; PH=plant height; # of PPP=number of pods per plant; # of SPP= number of seeds per plant; 100swt=hundred seeds weight; Ascoch=Ascochyta; P.mildew=powder mildew; YID=seed yield*

## Appendix I. Agronomical and morphological characteristics of Arjo-1 and Bariso.

Characteristics	Arjo-1 (EH90025-1)	Bariso (EH90011-1-2)
1. Adaptation area:		
1.1. Altitude (masl)	2000-2600	2000-2600
1.2. Rainfall (mm)	1000-1300	1000-1300
2. Fertilizer rate:		
2.1. DAP (kg/ha)	100	100
3. Planting date	Mid to late June	Mid to late June
4. Seed rate (kg /ha):	150 - 200	150 - 200
5. Days to flower	60 - 70	58 - 70
6. Days to maturity	110 - 120	109 - 118
7. Plant height (cm)	120 - 140	118 - 130
8. Number of pods per plant	6 - 17	6 - 20
10. Pod character	full (not constricted)	full (not constricted)
11. Seed shape and character	Round and smooth	Round and smooth
12. Seed coat color	White	White
13. Cotyledon color	Light orange	Light orange
14. 100 seed weight (g)	22	20
15. Yield (ton/ha):		
17.1. Research field	2.53	2.61
17.2. Farmer field	2.00	2.01
16. Year of release	2005	2005

## II. Registration of 'Angar ' Haricot Bean (*Phaseolus vulgaris* L.) Variety

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**Abstract:** Angar is a common name for the haricot bean (*Phaseolus vulgaris* L.) variety with the pedigree name EMP-376. It was developed and released by Bako Agricultural Research Center for western Ethiopia. This variety was evaluated for four years at Bako, Gute and Boshe and it was found to be the best productive variety. Angar is moderately resistant to common bacterial blight, angular leaf spot, web blight and resistant to anthracnose and floury leaf spot. Results of multi-location trials showed that Angar was superior in grain yield performance across years and locations. Angar was studied for yield stability and it had above-average stability.

### 1. Agronomic and Morphological Characteristics

Angar has deep green leaves with white flowers and flowers from 41 to 52 days and matures from 85 to 96 days after emergence. The standard check, Red Wolaita, matures earlier than Angar by 6 days. Angar has a plant height ranging from 50 to 72 cm, the number of pods per plant ranges from 13 to 25 and the number of seeds per pod from 4 to 7. Angar has a better pod load and percentage of ground coverage than Red Wolaita. It has a kidney-shaped seed with dull lustre. Angar is a dark red seeded bean whereas Red Wolaita is a red seeded bean with shiny luster. Angar has a seed size ranging from 25 to 30 g per 100 seeds, with 20 to 26 g per 100 seeds for Red Wolaita. Angar is a variety that is suitable for irrigation, rain-fed agriculture and early sowing. It can be intercropped with maize, sorghum and pepper. A summary of the agronomic and morphological characteristics is given in Appendix I.

### 2. Yield Performance

At the early breeding stages, Angar was evaluated at Bako from 1997 to 1999 for seed yield and other yield-related traits and showed better performance than the standard check, Red Wolaita. In multi-location yield trials at Bako, Boshe and Gute from 2000 to 2003, Angar gave a mean seed yield of 2.3 tons ha<sup>-1</sup> (Table 1) compared to 1.2 tons ha<sup>-1</sup> for the standard check, Red Wolaita. On farmers' field trials from 2004 to 2005, Angar gave a mean seed yield of 2.6 tons ha<sup>-1</sup> compared to 1.9 tons ha<sup>-1</sup> for Red Wolaita.

### 3. Stability performance

Yield stability in sixteen bush bean varieties was studied for two years across three locations, based on the method of Eberhart and Russel (1966). The regression coefficient of Angar was less than unity, indicating that it has above-average stability and is better adapted to unfavorable growing conditions.

### 4. Disease reaction

Angar is moderately resistant to common bacterial blight (*Xanthomonas campestris*), angular leaf spot (*Isariopsis sriseola*) and web blight (*Rhizoctonia solani*). It is resistant to anthracnose (*Colletotrichum lindemuthianum*) and floury leaf spot (Table 1).

### 5. Quality analysis

The results of laboratory tests (Table 2) indicated that Angar has 2% non-soakers and 21 minutes cooking time whereas Red Wolaita obtained 11% non-soakers and 28 minutes cooking time, confirming the superiority of Angar over Red Wolaita with regard to factors that affect food quality (Negash *et al.*, 2005).

### 6. Conclusion

The bush bean variety, Angar, was the best yielder variety. It has above average stability in grain yield performance and adapts better to unfavorable growing conditions. It has a high pod load with moderate resistance to significant diseases. This variety was released for production in low- to mid-altitude areas of western Ethiopia and areas with similar Agro ecology. It was named after a big river that crosses the Dhidhessa valley. It is a potential river for irrigation.

### 7. References

- Eberhart, S.A. and Russel, W.A. 1966. Stability parameters for comparing varieties. *Crop Science* 6:36-40.
- Negash, G., Chemeda, D. and Abeya, T. 2005. On-farm evaluation of four candidate varieties of common bean in western Oromiya, Ethiopia. *In: Opportunities and Challenges for Transforming Agriculture in Africa*, 7<sup>th</sup> African crop science society conference, 5-9 Dec. 2005, Entebbe, Uganda

Table 1. Summary of pooled mean of yield and other data on Angar and the check across locations and years.

Varieties	DF	DM	PH (cm)	Seed size(gm)	# of PPP	# of SPP	Pod height	YID (ton/ha)	CBB	ALS	FLS	Anth	WB
Anger	48	93	63	25-30	21	43	10	23.34	4	4	3	2	4
Red Wolita	43	88		20-26	20	35	9	12.10	6	3	5	6	5

*DF=days to flower; DM=days to maturity; PH=plant height; # of PPP=number of pods per plant; # of SPP= number of seeds per plant; YID=seed yield; CBB=common bacterial blight; ALS=angular leaf spot; FLS=floury leaf spot, Anth=anthracnose; WB=web blight*

Table 2. Summary of laboratory analysis made by Holetta Agricultural Research Center, Food Science Division, Ethiopia.

Variety name	Weight of 100 seed (gm)	# of non-soakers	Cooking time (minute)
Angar	25.8	2	21
Check standard (Red Wolita)	23.8	11	28

## Appendix I. Agronomical and morphological characteristics of Angar (EMP-376).

1. Adaptation area:	
1.1. Altitude (masl)	1300-2000
1.2. Rainfall (mm)	1000-1300
2. Fertilizer rate:	
2.1. DAP (kg/ha)	100
3. Planting date	Mid -Late June
4. Seed rate:	100 kg/ha
4.1. Spacing (inter x intra row)	40 cm x 10 cm
5. Days to flower	41-52
6. Days to maturity	85-96
8. Plant height (cm)	63
9. Number of pods per plant	21
10. Number of seeds per Pod	6
11. Pod height (cm)	12
12. Seed shape	Kidney
13. Seed color	Dark red
14. Seed coat lustre	Dull
15. 100 seed weight (g)	28
16. Crop pest reaction	tolerant to major diseases
17. Yield (ton/ha):	
17.1. Research field	2.0 - 3.2
17.2. Farmer field	2.0 - 2.8
18. Year of release	2005

### III. Registration of 'Tibe' Climbing Bean (*Phaseolus vulgaris* L.) Variety

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**Abstract:** Tibe is a common name for the climbing bean (*Phaseolus vulgaris* L.) variety with the pedigree name 812-BRC-28. It was developed and released by Bako Agricultural Research Center for western Ethiopia. This variety was evaluated at Bako, Boshe, Gute and Loko, at stations and on farms and it was superior in grain yield performance over the local check. The results of yield stability study showed that Tibe was the most productive variety with maximum stability. It is suitable for intercropping with maize, sorghum, and for sole cropping. It is moderately resistant to bacterial blight, angular leaf spot, floury leaf spot, anthracnose, and web blight. In addition, it is superior in grain yield performance.

#### 1. Agronomic and Morphological Characteristics

Early maturity was considered as one of the most important criteria for selecting Tibe for the reason that almost all local climbers are late. The low leaf loads with uniformly distributed pods through out the plant profile makes Tibe suitable for intercropping with maize. The locals were more aggressive for intercropping with maize due to their higher vegetative growth habits. Tibe has good resistance to shattering. Tibe flowers from 50 to 58 days and matures from 95 to 103 days after emergence. It has white flowers and red seeds with a shiny luster and white helium. It has a red pod color at maturity and its plant height ranges from 180 to 195 cm, the number of pods per plant ranges from 12 to 84 and the number of seeds per pod ranges from 4 to 7. Tibe has a pod height (the height from the ground to the first pod) which varies from 10 to 20 cm compared to 70 to 110 cm for the local checks. It has kidney shaped seeds with a seed size ranging from 25 and 35 g per 100 seeds. A summary of its agronomic and morphological characteristics is given in the appendix.

#### 2. Yield Performance

Tibe was bred by pure line selection out of accessions introduced from Rwanda. It was evaluated for seed yield at multi-locations from 1999 to 2003 and showed a better performance than the local checks. For mixed culture, wider spacing (75 cm inter and 10 cm intra row spacing) was used, while for sole culture 45 cm inter and 10 cm intra row spacing was recommended. Using the former spacing, Tibe gave a mean seed yield of 2.4 tons ha<sup>-1</sup> (Table 1) at research stations and 2.5 tons ha<sup>-1</sup> on farmers' fields, the relative advantage over local checks being 36% and 92% respectively. Using the spacing recommended for sole culture, Tibe gave a mean seed yield of 3.7 tons ha<sup>-1</sup> at station level.

#### 3. Stability performance

Yield stability in eight climbing bean varieties were studied for two years across four locations, based on the method of Eberhart and Russel (1966). The result of the study showed that Tibe was the best productive variety in grain yield performance and showed maximum stability (Chemeda *et al.*, 2005).

#### 4. Disease reaction

Tibe is moderately resistant (Table 1) to foliar diseases such as common bacterial blight (*Xanthomonas campestris*), angular leaf spot (*Phaeoisariopsis griseola*), floury leaf spot (*Mycovellosiella phaseoli*), anthracnose (*Collectotrichum lindemuthianum*) and web blight (*Rhizoctonia solani*).

#### 5. Quality analysis

The laboratory analysis (Table 2) indicated that Tibe required an equal amount of time and was higher as a non-soaker compared to the standard check, Red Wolita.

#### 6. Conclusion

Tibe is a stable variety according to its grain yield performance. It has good agronomic traits that make it suitable for intercrossing with maize and sorghum. It is adaptable to a wide environment. Tibe is resistant to important diseases affecting haricot beans in the areas. This climbing variety was released for production in areas ranging from lowland to mid-altitude in Ethiopia. It was named after a place which is known for its high maize production usually intercropped with the climbing bean. Tibe is the first climbing bean variety released in Ethiopia.

#### 7. References

- Chemeda, D., Negash, G., Abeya, T. and Firdissa, E. 2005. Genotype x environment interaction and yield stability of climbing bean (*Phaseolus vulgaris* L.) varieties. *Ethiopian Journal of Agricultural Science* 18(1): 123-127.
- Eberhart, S.A. and Russel, W.A. 1966. Stability parameters for comparing varieties. *Crop Science* 6:36-40.

Table 1. Mean values for seed yield (Yid), days to flowering (DF), days to maturity (DM), number of pod per plant (#Po/p), number of seeds per plant (#Se/P) and hundred seed weight (HSW).

Varieties	DF	DM	#Po/ P	#Se/ P	HSW	Yid (ton/ha)	CBB	ALS	FLS	Anth	WB
Tibe	54	101	16	86	29	23.71	4	3	3	2	2
Local check	62	102	10	55	45	19.13	4	4	3	3	2

*CBB=common bacterial blight; ALS=angular leaf spot; FLS=floury leaf spot; Anth=Anthracnose; WB=Web blight*

Table 2. Summary of laboratory analysis by Holetta Agricultural Research Center, Food Science Division, Ethiopia.

Variety name	Weight of 100 seed (gm)	# of non-soakers	Cooking time (minute)
Anger	32.2	54	101
Check standard (Red Wolita)	49.3	28	100

Appendix I. Agronomical and morphological characteristics of Tibe (812-BRC-28).

1. Adaptation area:	
1.1. Altitude (m.a.s.l.)	1300-2100
1.2. Rainfall (mm)	1000-1300
2. Fertilizer rate:	-
2.1. DAP (kg/ha)	100
3. Planting date	Early June
4. Seed rate:	-
4.1. Spacing for sole (inter x intra row)	45 cm x 10 cm
5. Days to flower	54
6. Days to maturity	101
7. Pod color	Red
8. Plant height (cm)	175
9. Number of pods per plant	12 - 84
10. Number of seeds per pod	6
11. Pod height (cm)	15
12. Seed shape	Kidney
13. Seed color	Red
14. Seed coat lustre	Shiny with white hila
15. 100 seed weight (g)	29
16. Crop pest reaction	Resistant to major diseases
17. Yield (ton/Ha):	
17.1. Research field	2.37
17.2. Farmer field	2.49
18. Year of release	2004