

Full Length Research Paper

Registration of “*Dibannee*”, a newly released linseed variety for Bale Highlands, Ethiopia

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Dibannee (CI-1525x CDC 1747/21), a medium height brown seed variety of linseed was selected and developed by Sinana Agricultural Research Center, eastern Oromia, Ethiopia. The variety was released in 2009 for Bale highlands and similar agro-ecologies. This variety was selected from the variety trial tested together with 15 other test genotypes and checks (local cultivar and the previously released variety for comparison) at 6 environments and two locations (Sinana and Lower dinsho) in the highlands of Bale Eastern Oromia, Ethiopia for three consecutive years (2005/06 to 2007/08). After the trial had been conducted for the above three consecutive years, this variety was selected and verified for one more season in order to see its performance across locations. Finally, due to its superior performance, dibannee was selected and verified at four locations during bona 2008/09 cropping season and thereby released for production. This variety is characterized by brown seed color, having high yield with yield advantage of 11.42 and 19.80% over the standard and local checks respectively. It is stable, best adapted, having large number of capsules per plant, thousand seed weight, and oil content, moderately resistant to powdery mildew, pasmo and wilt.

Key words: Dibannee, variety registration, oil content

INTRODUCTION

Linseed, *Linum usitatissimum* L. (n = 15), also called flax, is an important oilseed crop which belongs to the family linaceae having 14 genera and over 200 species. Linseed is the only widely grown and economically important species. It is believed that this crop species may have originated from *Linum angustifolium* Huds (n = 15), native to the Mediterranean region. The genus *Linum* has both cultivated and wild species. The wild species have little economic value. Almost all the species are annual herbs and some are shrubs. *L. usitatissimum* L. is the only species with non-dehiscent or semi-dehiscent capsules suitable for modern cultivation of the family linaceae (Getinet and Nigussie, 1997). *L. usitatissimum* L. is one of the oldest plant species cultivated for oil and fiber (Lay and Dybing, 198; Belayneh, 1985; Mirza et al., 1996). The crop is predominantly self pollinated, but out crossing (less than 2%) occasionally results from insect

activity (Dillman, 1928). On the basis of growth habit, two types (long stemmed and short stemmed) are recognized. Long stem linseed produces a high quality fiber but the oil content of the seed is relatively low. On the other hand, short-stemmed linseed bears larger seeds of high oil content and has a branching tendency (Kaul, 1986)

The development of cultivars, which are adapted to a wide range of diversified environments, is the ultimate aim of plant breeders in a crop improvement program (Muhammad et al., 2003). The adaptability of a variety over diverse environments is commonly evaluated by the degree of its interaction with different environments in which it is grown. A variety is considered to be more stable if it has a high mean yield but a low degree of fluctuation in yielding ability when planted over diverse environments (Purchase, 1997).

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Genotype by environment interactions is important facts in cultivar evaluations. GxE interaction is considered as quantitative effect (Romagosa and Fox, 1993; Baker, 1988), which is composed of genotype (G) x location (L), genotype (G) x year (Y), and genotype (G) x location (L) x year (Y) constituents.

Dibanee (CI-1525 x CDC 1747/21), the variety released by Sinana Agricultural Research Center, Eastern Oromia, Ethiopia in 2009, originally resulted from the cross of the released varieties CI-1525 and CDC 1747/21 in 1998. Then, from 1999 to 2003, the subsequent generation was handled till the desired traits in the genotypes was fixed and the segregation of the generation was completed. In 2004, 25 genotypes were selected from the previous generation and evaluated in the yield trial at the main research center, Sinana. Then from 2005/06 to 2007/08, the variety dibanne, along with other 14 genotypes were evaluated in the multi-location trial to see its yielding potential and its reaction to some linseed disease. After the multi-location trial had been conducted for three consecutive years (2005/06 to 2007/08), dibannee was selected out of fifteen genotypes to be verified over locations and then evaluated by the National Variety Releasing Committee as per the guide line of the variety releasing and registration of the country during 2009 cropping season.

METHODOLOGY

Testing location and season

The experiment was carried out at two locations. One of the experiments was conducted at the research farm of Sinana Agricultural Research Center, Oromia Agriculture Research Institute, Sinana, and the other at a site in the farmer's field, Lower Dinsho. The experiment was conducted from the cross till the verification trial (1998 to 2007/08) at each location on vertisol clay loam soil under rain fed conditions during the meher season (August-January) of 2001/2002 cropping season. Sinana Research Center (7°N latitude and 40°E longitude; and 2400 m a.s.l.) is located 463 km south east of Addis Ababa and East of Robe, the capital of Bale zone. The other location is located 45 km from Sinana and about 5 km from Robe in the Southwest direction. Because of the suitability of the region for linseed production, it is expected that the test genotypes would express their genetic potential to a higher extent for the traits under consideration.

This variety was been released after it has been evaluated in the screening and evaluation of the segregating generation for the subsequent years. In the yield trial, a total of 25 genotypes including the local cultivar and the previously released varieties was evaluated using simple lattice design at Sinana on-station for one season. At this time, agronomic data such as days to flower, days to maturity, plant height, stand percentage, thousand seed weight, yield/plot was collected in plant and plot basis. Finally, the collected data was subjected to statistical analysis to select the genotypes as compared to the checks. In the multi-location trial, 15 genotypes retained from the yield trial were further evaluated at two locations for three years in the verti-clay loam soil to show its stability across location. The genotypes in the multi-location trial were evaluated using randomized completed design with four replications. Fertilizer at the rate of 23/23 N/P2O5 was applied and hand weeding was done twice. Agronomic and yield data were collected and subjected

to statistical analysis in order to identify the best genotypes out of the evaluated genotypes. Finally, dibanne was selected and verified along with local cultivar, and two standard checks, previously released varieties at the main station Sinana and at the other research field, Lower Dinsho for one season. The verification trial was evaluated by the National Variety Releasing Committee at field condition and was been released fully for the highlands of bale and similar agro-ecologies.

RESULTS AND DISCUSSION

Varietal characters

Dibanee has medium plant size with brown seed color. On average, this variety needs 76 days for flowering, and 150 days to reach physiological maturity. It has plant height of 74 cm. It has brown seed coat with pink flower. The average weight of thousand seeds is 5.7 g. The variety has an oil content of 38.0% (Table 1).

Yield performance

The average seed yield of dibannee combined over locations and over years is 1.16 t/ha which is higher than Belay-96 (standard check) (1.041 t/ha), and the local check (0.88 t/ha). The variety gives seed yield of 1.5 to 2.0 t/ha on the research field whereas it gives 1.0 to 1.25 t/ha on farmers field. This variety has yield advantage of 11.42 and 19.80% over the standard and local checks, respectively (Table 2).

Reaction to disease

The major linseed diseases according to their importance in the growing areas are powdery mildew (*Oidium* spp.), pasmo (*Septoria linicola*) and Wilt (*Fusarium oxysporum*) (Getinet and Nigusie, 1997). In 1-9 rating scale, dibannee scored a mean of 4 for all the above mentioned diseases. The variety is characterized by moderately resistance types of reaction to these major diseases at all the sites. The disease score for the variety and the checks are summarized in Table 1.

Quality

The variety is characterized by having high percent of oil content which can serve as cash crops for the farming community. It is preferred by both consumers and producers due to its oil content and seed size.

Adaptation

Dibanee is released for the highlands of Bale. It performs very well in area having an altitude of 1800 to 2600 m.a.s.l and annual rain fall of 750 to 1000 mm. It can also possibly extend the production of this variety to other areas having similar agro-ecologies. This variety give better grain yield if it is produced with recommended fertilizer rate of 23/23 kg/ha N₂/P₂O₅ and seed rate of 25 to 30 kg/ha in clay-loam soil. For better performance of the variety it is better if planting is done from the end of July to early August in Meher and to the end of March during Belg season.

Variety maintenance

Breeder and foundation seed of the variety is maintained by Sinana Agricultural Research Center.

Table 1. Mean grain yield, other agronomic traits and disease reaction of dibanee and the checks in multi-location test during 2005-2007/08.

Entry	Days to flower	Days to maturity	Plant height (cm)	Stand (%)	1000 seed weight (g)	Oil content (%)	Disease score (1-9) ^a			Mean grain yield (t/ha) ^b
							PM.	Pasmo	Wilt	
Dibanee (CI-1525 x CDC 1747/21)	76	150	74	68	5.7	38.0	4	4	4	1.160
Belay-96	76	151	74	70	5	35.5	5	6	5	1.041
Local check	75	149	75	71	5	36.8	5	5	6	0.968
Mean	76	150	74	70	5.23	36.76				1.06

PM, Powdery mildew; ^aDisease score based on 1-9 scale where 1 is highly resistance and 9 is highly susceptible; ^baverage grain yield of 6 environments (2 locations x 3 years).

Table 2. Combined mean seed yield and other agronomic traits of linseed regional variety trial over years (2004-2006) and over two locations (Sinana and Lower-dinsho).

P#	Entry	Days to flower	Days to mature	Plant height (cm)	Stand (%)	1000 seed weight (g)	Seed yield (kg/ha)	(Disease 1-9 scale)		
								Powdery mildew	Pasmo	Wilt.
1	Accn. 13542	71	144	70	76	4.9	1001	5	5	5
2	Accn. 13640	69	139	57	77	3.9	784	6	6	4
3	Accn. 204741	69	140	57	78	4.9	915	4	5	6
4	Accn. 207202	64	140	57	77	5.0	922	5	5	4
5	Accn. 207206	63	139	56	78	5.3	1021	5	5	4
6	Accn. 207210	64	139	57	78	5.2	1015	5	5	6
7	Accn. 207233	67	140	57	73	4.7	889	5	5	5
8	Accn. 207972	68	140	56	77	3.4	958	5	5	5
9	Chilalo x CDC 1747/18	79	145	74	81	5.2	1076	4	4	4
10	CI-1525 x CDC 1747/21 (Dibanee)	73	145	72	79	5.7	1169	4	4	4
11	CI-1525 x CDC 1747/32	69	141	61	78	5.4	922	4	4	4
12	PGRC/E 10166	73	145	72	79	5.0	1129	4	4	4
13	Belay-96 (St. check)	73	145	72	78	5.0	1054	4	5	4
14	Chilalo (St. Check)	75	144	75	79	5.0	967	5	6	5
15	Local check	73	145	74	76	5.0	1008	5	5	6
	Mean	70	142	65	77	4.91	989			
	CV (%)	2.04	1.43	8.41	7.50	3.93	16.60			
	LSD 5 (%)	1.99	2.83	7.56	8.08	0.27	228.50			

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