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**Research Article**

# Arpita: a new linseed cultivar for Odisha

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**Abstract**
A linseed cultivar 'Arpita' was released in Odisha for cultivation both under rainfed and *utera (paira)* cropping situations by the State Sub- Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, Government of Odisha, Bhubaneswar in its meeting held on 05.12.2014. It matures in 104 days, yields 849 kg seed per hectare under rainfed condition and contains 35.67 per cent drying oil. It has yield advantage of 89.01 per cent, 11.22 per cent and 54.27 per cent over national check 'Indira Alsi 32', zonal check 'Sharda' and local check 'OLC 10', respectively. It is resistant to wilt and powdery mildew, and moderately resistant to bud fly.

**Key words**
Arpita, linseed, oilseed, variety release

## Introduction

Linseed or flax (*Linum usitatissimum* L) is the second most important *rabi* (winter) oilseed crop and stands next to rapeseed- mustard in area and production in India. It is popularly known as *atasi, pesi, phesi or tisi* in Odia. Although linseed plants have several utilities, it is commercially cultivated for its seed, which is processed into oil and after extraction of oil, a high protein livestock feed is left (Sankari, 2000; Kurt and Bozkurt, 2006). Linseed oil has been used for centuries as a drying oil whose oil content varies from 33-45% (Gill, 1987). About 20% of the total linseed oil produced in India is used by the farmers and the rest about 80% goes to industries for the manufacture of paints, varnish, oilcloth, linoleum, printing ink etc. Linseed has an important position in Indian economy due to its wide industrial utility. But the national average productivity of linseed seed is quite low as compared to other countries (Srivastava, 2009).

As per Food and Agriculture Organization (FAOSTAT, 2014), India ranks 4$^{th}$ among world's linseed producing countries. However, in terms of productivity, India (392 kg/ha) is far below than Switzerland (2647 kg/ha), Tunisia (2633 kg/ha), U.K. (2600 kg/ha), France (2121 kg/ha) and New Zealand(1853 kg/ha). In India during 2013-14 linseed is grown in an area of 292.1 thousand hectares with annual production of 141.2 thousand tonnes and productivity of 484 kg/ha. Out of 15 linseed growing states, the major are Madhya Pradesh (110.4 thousand ha), Maharashtra (31.0 thousand ha), Chhattisgarh (26.2 thousand ha), Uttar Pradesh (26.0 thousand ha), Jharkhand (25.5 thousand ha), Odisha (22.9 thousand ha) and Bihar (18.7 thousand ha). In Odisha, the annual production is 11 thousand tonnes with productivity of 478 kg/ha (Anonymous, 2015). The low productivity of linseed is mainly due to low yield potential of the existing cultivars with poor crop husbandry. So, with the objective of high yield, earliness and resistance to biotic stress, a breeding programme was initiated.

## Materials and methods

The present Hybridization programme was initiated in the All India Coordinated Research Project on Linseed, Jashipur, Mayurbhanj, (shifted to RRTTS, Kenojhar), Odisha by crossing the selected parents RLC 29 and R 1871 and the segregating generation was handled with pedigree method of selection. A breeding line, *viz*, 'OL 98-13-1' was identified promising. It was tested in different AICRP testing centres under zone IV (Raipur, Nagpur, Raichur, Jashipur, Bilaspur and Latur) and zone III (Sagar, Mauranipur, Hoshangabad and Durgapur) of India during *rabi* 2011-12 in Randomized Block Design (RBD) with three replications. Multi-location trial (MLT) was conducted in different agro-climatic zones of Odisha, *viz.*, North Central Plateau Zone (Locations: Jashipur and Shamakhunta), Western Undulating Zone (Location: Nuapada) and Eastern Ghats Highland Zone (Location: Pottangi) during *rabi* 2012-13.

## Results and discussion

The pooled data (2007-08 to 2012-13) of the Station Preliminary Yield Trials (Table 1) revealed the yield advantage of 'OL 98-13-1' (974.45 kg/ha) by 89.01% over the national check 'Indira Alsi 32' (515.56 kg/ha), 11.22 per cent over the zonal check 'Sharda' (876.11 kg/ha) and 54.27 per cent over the local check 'OLC 10' (631.67 kg/ha).

In the All India coordinated trial during 2011-12, the seed yield of 'OL 98-13-1' had the highest zonal average of 849 kg/ha in Zone IV. It recorded

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average yield advantage of 15.20 per cent over the national check 'T 397', 39.41 per cent over zonal check 'JLS 9', 14.11 per cent over zonal check 'NL 97' and 11.56 per cent over best check 'Sharda'. The average yield advantage of 'OL 98-13-1' over the best check ' Sharda' (11.56 %) tested over six locations in Zone IV during *rabi* 2011-12 corroborated the results of the Station Preliminary Yield Trials (PYTs) pooled over 2007-08 to 2012-13. The duration of 'OL 98-13-1' ranged from 88 to 108 days in six trials of Zone IV and was 104 days in the Station PYTs conducted over years (Table 1)

The reaction of 'OL 98-13-1' to major diseases and insect pests was moderately susceptible to highly resistant to *Alternaria* blight, resistant to highly resistant to wilt, resistant to highly resistant to powdery mildew and moderately resistant to bud fly ( Table 2).

The multi-location trials (MLTs) conducted in different agro-climatic zones of Odisha during 2012-13 corroborated the results of All India Coordinated Trials and Station PYTs tested over years (Table 1).

The agronomic, morphological and biochemical characteristics of 'OL 98-13-1' are presented in Table 3. It is suitable for cultivation under rainfed and *utera* situations in *rabi* season. Its duration is 104 days. The range of seeding to flowering is 45-67 days and that of seed to seed is 88-111 days. It is highly responsive to fertilizers and gives average seed yield of 849 kg/ha with potentiality of 1299 kg/ha. It is erect with two primary branches and medium in height (49 cm) flowering in 53 days. The plant, on an average, bears 31 non-dehiscent capsules of medium size with seven light brown seeds per capsule. The 1000-seed weight is 6.54 g. The seed contains 35.67 % drying oil with oil yield of 303 kg/ha. The oil is a rich source (45.10 %) of linolenic acid (Omega 3).

Considering the performance of 'OL 98-13-1', it was released as 'Arpita' (Fig. 1) by the State Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, Government of Odisha, Bhubaneswar in its meeting held on 05.12.2014 for cultivation in Odisha under rainfed and *utera* (*paira*) ecosystems. By popularizing 'Arpita' among farmers, the production and productivity of linseed in Odisha will increase manifold in near future.

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**Table 1. Overall mean performance of OL 98-13-1**

| Name of the Trial | Location | Seed yield (kg/ha) | | | | | | | Duration (Days) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OL 98-13-1 | OLC 10 (LC) | Sharda (ZC) | Indira Alsi 32 (NC) | T 397 (NC) | JLS 9 (ZC) | NL 97 (ZC) | OL 98-13-1 | OLC 10 (LC) | Sharda (ZC) | Indira Alsi 32 (NC) | T 397 (NC) | JLS 9 (ZC) | NL 97 (ZC) |
| Station Preliminary Yield Trial (2007-08 to 2012-13) | 01 | 974.45 | 631.67 | 876.11 | 515.56 | - | - | - | 104.0 | 105.3 | 104.7 | 107.0 | - | - | - |
| Yield advantage over checks (%) | | | 54.27 | 11.22 | 89.01 | | | | | | | | | | |
| All India coordinated trial Zone IV (2011-12)* | 06 | 849.0 | - | 761.00 | - | 737.00 | 609.00 | 744.00 | 104.0 | - | 106.0 | - | 105.0 | 108.0 | 108.0 |
| Yield advantage over checks (%) | | | | 11.56 | | 15.20 | 39.41 | 14.11 | | | | | | | |
| State Multi Location Trial (2012-13) | 04 | 865.58 | - | 780.28 | 618.12 | 790.31 | - | - | 104.2 | - | 112.8 | 111.3 | 107.9 | - | - |
| Yield advantage over checks (%) | | | - | 10.93 | 40.03 | 9.52 | | | | | | | | | |
| Overall mean | 11 | 896.34 | 631.67 | 805.80 | 566.84 | 763.66 | 609.00 | 744.00 | | | | | | | |
| Yield advantage over checks (%) | | | 41.90 | 11.24 | 58.13 | 17.37 | 47.18 | 20.48 | | | | | | | |

* Source: Annual Report 2011-12, AICRP on Linseed, p.61

**Table 2. Reaction of OL 98-13-1 to major diseases and insect pests in different locations of Zone IV during 2011-12**

| Entry | *Alternaria* blight (0-5 scale) | | | Wilt ( in %) | | Powdery mildew (0-5 scale) | | Bud fly (0-5 scale) | |
|---|---|---|---|---|---|---|---|---|---|
| | Jashipur | Nagpur | Mauranipur | Jashipur | Mauranipur | Raichur | Nagpur | Mauranipur | Nagpur |
| OL 98-13-1 | MS (3) | MS (3) | HR (0) | R (5%) | HR (0%) | HR (0) | R (1) | MR (2) | MR (2) |

HR: Highly Resistant; R: Resistant; MR: Moderately Resistant; S: Susceptible; MS: Moderately Susceptible
Source: Annual Report 2011-12, AICRP on Linseed, p. 60-62

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**Table 3. Agronomic, morphological and biochemical characteristics of OL98-13-1**

| Characters | | Description |
|---|---|---|
| **Agronomic** | | |
| Ecosystem | : | Rainfed and *utera* situations in *rabi* |
| Duration | : | 104 days |
| Seeding to flowering | : | 45-67 days |
| Seed to seed | : | 88-111 days |
| Seedling survival | : | 80-90 % |
| Seed rate | : | 25 kg/ha (Rainfed), 30 kg/ha (*Utera)* |
| Fertilizer response | : | Highly responsive |
| Phenotypic acceptability | : | Good |
| Seed yield (Rainfed) | : | 849 kg/ha (Average), 1299 kg/ha (Potential) |
| **Morphological** | | |
| Habit (Plant type) | : | Erect |
| Plant height | : | 49 cm (Medium) |
| No. of primary branches/plant | : | 2.0 |
| Days to 50% flowering | : | 53 days |
| Flower colour, shape, size | : | Blue, disc, medium |
| Stamen colour | : | Light blue |
| Fertility percentage | : | 91.9 % |
| Capsule size | : | Medium |
| No. of capsules/plant | : | 31.0 |
| Capsule dehiscence | : | Non- dehiscent |
| No. of seeds/capsule | : | 7.0 |
| Seed colour | : | Light brown |
| Seed size | : | Medium |
| 1000- seed weight | : | 6.54 g |
| **Biochemical** | | |
| Oil content | : | 35.67 % |
| Oil yield | : | 303.0 kg/ha |
| Palmitic acid (16:0) | : | 6.97 % |
| Stearic acid (18:0) | : | 7.01 % |
| Oleic acid (18:1) | : | 27.11 % |
| Linoleic acid (18:2) | : | 13.82 % |
| Linolenic acid (18:3) (Omega 3) | : | 45.10 % |
| Iodine value | : | 165.49 |

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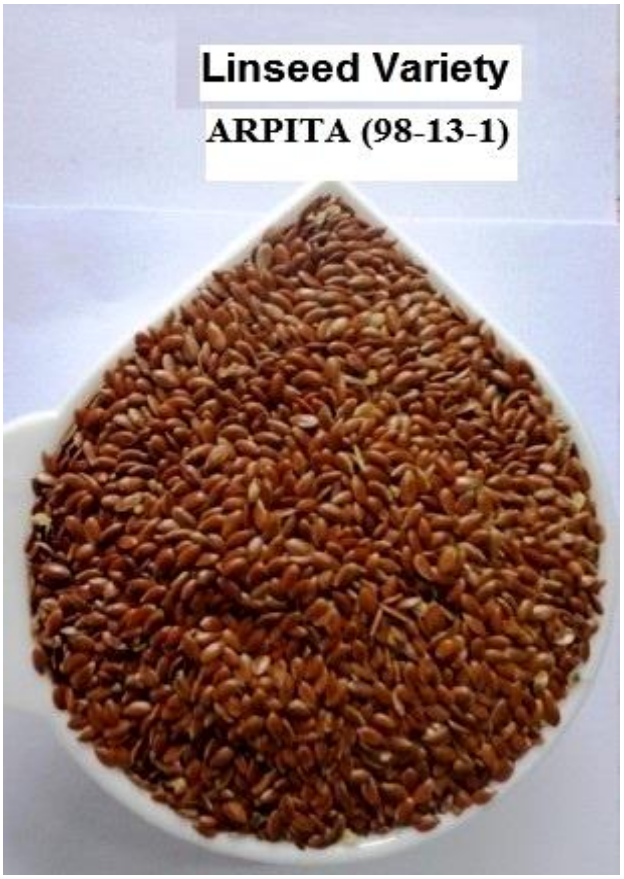
**Plant**

**Flower**




**Seeds**

**Fig. 1. Arpita cultivar – plant, flower and seeds**