RESEARCH PAPER

ADVANCE RESEARCH JOURNAL OF
C R P
IMPROVEMENT
Volume 6 | Issue 1 | June, 2015 | 39-42
e ISSN-2231-640X

DOI :
10.15740/HAS/ARJCI/6.1/39-42
Visit us: *www.researchjournal.co.in*

# Crop growth rate, leaf area index as affected by sowing dates in linseed (*Linum usitatissimum* L.)

■ B.S. ROKADE[1], P.S. KAMBALE[1], J.D. JADHAV AND K.T. MADANE[1]

AUTHORS' INFO
**Associated Co-author :**
[1]Zonal Agricultural Research Station, SOLAPUR (M.S.) INDIA

**Author for correspondence:**
**J.D. JADHAV**
Zonal Agricultural Research Station, SOLAPUR (M.S.) INDIA
Email: slp.aicrpam@gmail.com

**ABSTRACT :** Experiment was laid out in Split Plot Design with three replications. The treatments consisted of 6 dates of sowing $D_1$: 40th MW, $D_2$: 41st MW, $D_3$: 42nd MW, $D_4$: 43rd MW $D_5$: 44th MW and $D_6$: 45th MW as main plot treatment and 3 cultivars $V_1$: Kiran $V_2$: Garima $V_3$: RLC-4 as sub plot treatment at college of Agriculture Latur during *Rabi* season. The data revealed that the LAI increased remarkably upto 75 DAS. The LAI increase in treatment $D_1$ was highest as compared to late sown crop. The LAI revealed increasing trend upto 75 days in treatment $D_1$. However, the other treatments followed this trend upto 60 days. The LAI reported considerable decrease, which was due to of senescences. LAI was recorded significantly higher in cv. GARIMA followed by cv. KIRAN. cv. RLC-4 recorded lowest LAI. Crop sown in treatment $D_1$ and $D_2$ reported a remarkable increase particularly during reproductive stage. In the early period CGR reported gradual increase, however, the increase was at higher rate in treatment $D_1$ and $D_2$. The crop growth rate of cultivars was increased upto 75 DAS and thereafter started decreasing. cv. GARIMA recorded more crop growth rate at all stages of crop growth upto 90 DAS than other cultivars.

**KEY WORDS :** Crop growth rate, Leaf area index, Linseed

**How to cite this paper :** Rokade, B.S., Kambale, P.S., Jadhav, J.D. and Madane, K.T. (2015). Crop growth rate, leaf area index as affected by sowing dates in linseed (*Linum usitatissimum* L.). *Adv. Res. J. Crop Improv.,* **6** (1) : 39-42.

**Paper History : Received :** 29.01.2015; **Revised :** 22.04.2015; **Accepted :** 25.05.2015

Linseed (*Linum usitatissimum* L.) is an important *Rabi* oilseed crop. It is grown under rainfed (63%), utera (20%) and irrigated (17%) conditions. It contains 35 to 47 per cent oil and 11 to 32 per cent protein. The oil extracted from linseed is mainly used in paint industries as a medium for oil paint, pad ink and printing ink etc. The oil is also used to some extent in the soap industries, pharmaceutical industries and other allied industries. In India the paint and allied industries is the major consumer of linseed accounting to 70 per cent of the total consumption. Linseed oil is also used in adulteration of the mustard oil, whenever the price of the latter is high. The major states that consume linseed oil in India are West Bengal, Maharashtra, Delhi and Uttar Pradesh accounting for 25 per cent of the total consumption in India (Anonymous, 2006).

## RESEARCH PROCEDURE

The field experiment was laid out in Split Plot Design with three replications. The treatments consisted of 6 dates of sowing $D_1$: 40th MW, $D_2$: 41st MW, $D_3$: 42nd MW, $D_4$: 43rd MW $D_5$: 44th MW and $D_6$: 45th MW as main plot treatment and 3 cultivars $V_1$: Kiran $V_2$: Garima

$V_3$: RLC-4 as sub plot treatment at college of Agriculture Latur during *Rabi* season.

**Crop growth rate (CGR) :**

The crop growth rate (g day $^{-1}$ m$^{-2}$) was computed by using the following formula:

$$CGR = \frac{1}{A} \times \frac{W_2 - W_1}{t_2 - t_1}$$

where, $W_1$ and $W_2$ are the dry weights (g) of crop harvested from unit area (A) of ground at times $t_1$ and $t_2$, respectively.

**Leaf area index (LAI):**

Green leaf area (cm$^2$) was measured for the purpose of computation of LAI with the help of a leaf area meter (LI-3100 area meter, LICOR), at an interval of 30 days from 15 days after emergence to physiological maturity from third replication. Three plants from guard rows were collected. Detaching the leaves from each plant and then passing them through the leaf area meter just after the sampling, measured the total green leaf area. The total numbers of green leaves plant$^{-1}$ were also recorded separately and average was computed. The LAI was computed by using the following formula :

$$LAI = \frac{\text{Total green leaves area (cm}^2\text{)}}{\text{Area occupied by the plants (cm}^2\text{)}}$$

The data recorded were statistically analyzed by using technique of analysis of variance (Fisher, 1921) and significance was determined as given by Panse and Sukhatme (1967).

## RESEARCH ANALYSIS AND REASONING

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

**Physiological parameters :**

Growth functions are the measures of growth rate in different growth parameters of plant. The data recorded on these aspects were not subjected to 'F' test of variances and results are interpreted on the basis of mean values.

**Leaf area index (LAI) :**

*Date of sowing* :

The data on mean LAI as influenced by different treatments are presented in Table 1. The data revealed that the LAI increased remarkably upto 75 DAS. Similar results were also recorded by Sharma and Hunsigi (1997). The LAI increase in treatment $D_1$ was highest as compared to late sown crop. The LAI revealed increasing trend upto 75 days in treatment $D_1$. However, the other treatments followed this trend upto 60 days. The LAI reported considerable decrease, which was due to of senescences.

*Cultivars* :

Data presented in Table 1 indicated that LAI was recorded significantly higher in cv. GARIMA followed by cv. KIRAN. cv RLC-4 recorded lowest LAI.

*Crop growth rate (CGR) (g day$^{-1}$ m$^{-2}$)* :

The data on mean crop growth rate (g day$^{-1}$ m$^{-2}$) are presented in Table 2.

*Date of sowing* :

The data revealed that the crop sown in treatment $D_1$ and $D_2$ reported a remarkable increased particularly

**Table 1 : Leaf area index (LAI) of linseed plant as influenced periodically by different treatments**

| Treatments | Days after sowing | | | | | |
|---|---|---|---|---|---|---|
| | 15 | 30 | 45 | 60 | 75 | 90 |
| **Date of sowing** | | | | | | |
| $D_1$ (MW 40) | 0.066 | 0.220 | 0.468 | 1.067 | 1.542 | 0.360 |
| $D_2$ (MW 41) | 0.060 | 0.208 | 0.459 | 0.611 | 0.536 | 0.343 |
| $D_3$ (MW 42) | 0.060 | 0.184 | 0.390 | 0.602 | 0.426 | 0.335 |
| $D_4$ (MW 43) | 0.054 | 0.140 | 0.387 | 0.471 | 0.408 | 0.326 |
| $D_5$ (MW 44) | 0.050 | 0.090 | 0.273 | 0.407 | 0.379 | 0.290 |
| $D_6$ (MW 45) | 0.036 | 0.129 | 0.239 | 0.277 | 0.293 | 0.260 |
| **Cultivars** | | | | | | |
| $V_1$ –Kiran | 0.052 | 0.147 | 0.350 | 0.549 | 0.431 | 0.317 |
| $V_2$- Garima | 0.061 | 0.169 | 0.411 | 0.684 | 0.479 | 0.345 |
| $V_3$- RLC-4 | 0.051 | 0.153 | 0.347 | 0.484 | 0.376 | 0.295 |

during reproductive stage. In the early period CGR reported gradual increase, however, the increase was at higher rate in treatment $D_1$ and $D_2$.

*Cultivar :*

The crop growth rate of cultivars was increased upto 75 DAS and thereafter started decreasing. cv. GARIMA recorded more crop growth rate, at all stages of crop growth, upto 90 DAS than other cultivars.

*Yield* :

The data regarding yield *viz.*, seed yield, straw yield, and total biomass are presented in Table 3.

*Seed yield (kg ha$^{-1}$)* :

The data presented in Table 3 revealed that mean seed yield (kg ha$^{-1}$) was influenced significantly by various dates of sowing and cultivars.

*Date of sowing* :

The mean seed yield (kg ha$^{-1}$) was found significantly higher in first ($D_1$) at MW 40 over other date of sowing treatments and was significantly superior. Similar trends were also recorded by Verma and Pathak (1993) and Sharma *et al*. (1995).

*Cultivars* :

The effect of cultivars on seed yield ha$^{-1}$ revealed that cv. GARIMA produced significantly higher seed yield than other cultivars. Similar findings were also reported by Verma and Pathak (1993).

**Table 2 : Mean crop growth rate (CGR) g/day/m$^{-2}$ as influenced by different treatments at various stages of crop growth**

| Date of sowing | 0-30 | 30-45 | 45-60 | 60-75 | 75-90 |
|---|---|---|---|---|---|
| **Treatments** | | | | | |
| $D_1$ (MW 40) | 0.016 | 0.063 | 0.073 | 0.197 | 0.013 |
| $D_2$ (MW 41) | 0.009 | 0.043 | 0.053 | 0.193 | 0.013 |
| $D_3$ (MW 42) | 0.008 | 0.048 | 0.013 | 0.066 | 0.02 |
| $D_4$ (MW 43) | 0.012 | 0.019 | 0.033 | 0.100 | -0.013 |
| $D_5$ (MW 44) | 0.012 | 0.023 | 0.027 | 0.040 | 0.007 |
| $D_6$ (MW 45) | 0.03 | 0.027 | 0.02 | 0.02 | 0.02 |
| **Cultivars** | | | | | |
| $V_1$ -Kiran | 0.06 | 0.040 | 0.046 | 0.073 | 0.013 |
| $V_2$- Garima | 0.07 | 0.046 | 0.053 | 0.10 | 0.020 |
| $V_3$- RLC-4 | 0.007 | 0.046 | 0.047 | 0.070 | 0.020 |
| General Mean | 0.0087 | 0.039 | 0.045 | 0.094 | 0.012 |

**Table 3 : Mean seed yield (kg ha$^{-1}$), straw yield (kg ha$^{-1}$), total biomass (kg ha$^{-1}$), as influenced by various treatments**

| Treatments | Seed yield (kg/ha) | Straw yield (kg/ha) | Total biomass (kg/ha) |
|---|---|---|---|
| **Date of sowing** | | | |
| $D_1$ (MW 40) | 889 | 2109 | 2998 |
| $D_2$ (MW 41) | 823 | 2999 | 2822 |
| $D_3$ (MW 42) | 654 | 1999 | 2653 |
| $D_4$ (MW 43) | 543 | 1540 | 2083 |
| $D_5$ (MW 44) | 473 | 1582 | 2055 |
| $D_6$ (MW 45) | 334 | 979 | 1313 |
| S.E. ± | 7.33 | 10.48 | 12.43 |
| C.D. (P=0.05) | 23.12 | 33.05 | 39.19 |
| **Cultivars** | | | |
| $V_1$ –Kiran | 613 | 1619 | 2232 |
| $V_2$- Garima | 656 | 1773 | 2429 |
| $V_3$- RLC-4 | 588 | 1712 | 2300 |
| S.E. ± | 6.4 | 6.8 | 6.5 |
| C.D. (P=0.05) | 19.0 | 19.92 | 19.02 |

*Straw yield* :

Data presented in Table 3 revealed that the mean straw yield of linseed was influenced significantly by different treatments.

*Date of sowing* :

The data presented in Table 3 revealed that second ($D_2$) date of sowing at MW 41 gave highest yield of 2999 kg $ha^{-1}$ and was significantly superior than other date of sowing treatments. Above results are in confirmation with Tomar and Mishra (1989) and Dixit *et al.* (1994). The significantly lowest straw yield of linseed was acquired by $D_6$ treatment at MW 45.

*Cultivars* :

The effect of cultivars on straw yield $ha^{-1}$ presented in Table 3 revealed that cv. GARIMA gave significantly higher straw yield than other cultivars.

*Biological yield* (*kg* $ha^{-1}$):

The data presented in Table 3 revealed that mean biological yield was influenced significantly by different treatments.

*Date of sowing* :

The data presented in Table 3 revealed that biological yield was found significantly more in first ($D_1$) date of sowing at MW 40 than other dates of sowing. The similar findings have been reported by researchers (Dixit *et al.*, 1994).

*Cultivars* :

The effect of cultivars on biological yield $ha^{-1}$ revealed that cv. GARIMA was significantly superior than other cultivars (Chaudhary, 2009).

**Conclusion :**

– The cv. GARIMA proved to be superior in recording more LAI, CGR and seed yield as compared to other cultivars.

– Sowing of linseed cv. GARIMA with first date of sowing MW 41 was found advantageous in recording more LAI, CGR and seed yield.

## LITERATURE CITED

Anonymous (2006). Annual progress report. All India co-ordinated Research Project on Linseed. Project co-ordinating Unit (Linseed). C.S.A.University of Agriculture and Technology, Campus, Kanpur, U.P. (INDIA).

**Chaudhary, Sanjai** (2009). Study on row spacings for different varieties of linseed (*Linum usitatissimum* L.). *Internat. J. Plant Sci.,* **4** (2) : 373-374.

**Dixit, J.P.,** Chourasia, S.K., Aillai, P.V. A. and Khan, R.A. (1994). Assessment of flexibility of sowing time of linseed (*Linum usitatissimum*) cultivars under double- cropping system in Tawa Command. *Indian J. Agron.,* **39**(1) : 105-109.

**Fisher, R.A.** (1921). *Statistical method for research works.* Oliver and Boyd and Co. Inc. Endinburgh

**Panse, V.G.** and Sukhatme, P.V. (1967). *Statistical methods for agricultural workers,* (1st Edn.), ICAR, NEW DELHI, INDIA.

**Sharma, Arjun** and Hunsigi, Gururaj (1997). Study on growth analysis in linseed (*Linum usitatissimum* L.). *Karnataka J. Agril. Sci.,* **10**(3) : 631-635.

**Sharma, J.J.,** Kapur, B.L. and Thakur, D.R. (1995). Performance of linseed (*Linum usitatissimum* L.) cultivars under varying dates of sowing in Kullu valley. *Himachal J. Agric. Res.,* **21**(1&2) : 23-26.

**Tomar, R.K.S.** and Mishra, G.L. (1989). Performance of some linseed varieties on different dates of sowing under rainfed condition. *J. Oilseeds Res.,* **8** (2) : 210-219.

**Verma, K.P.** and Pathak, R.K. (1993). Response of linseed (*Linum usitatissimum*) cultivars to different dates of sowing. *Indian J. Agron.,* **38**(1) : 60-63.