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Characterization of linseed fibre genotypes using biovi's seed image analyser

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Abstract
The laboratory experiment was carried out to study the Characterization of linseed genotypes using seed morphometric characters in the Department of Seed Science and Technology, College of Agriculture, UAS, Raichur. Linseed is grown for both for oil and fibre purpose. Long stemmed linseed produces a high quality fibre and short stemmed linseed bears larger seeds of high oil content. Characterization of varieties for purity testing as well as identification has attained much importance in seed production programme of almost all major crops. All sectors of seed industry benefit from the ability to assess cultivar purity and identity. Therefore, information on well-expressed and distinct characteristics of linseed genotypes should be made available to the seed producers and seed certification agencies in order to monitor the genetic purity both at field and seed stage. Biovi's seed image analyser will help to capture the images very fast, process it and produce the results effectively, accurately and it takes very less time. With this view, the present study was carried out to characterize thirteen different linseed fibre genotypes based on seed characteristics like length, width, and seed weight. The seed materials were collected from AICRP on linseed, PC Unit, Kanpur. The genotypes used for the study were 1) Jeevan, 2) Ruchi, 3) Pratapalsi 4) Parvati, 5) Meera, 6) Rashmi, 7) Shikha, 8) Nagarkot, 9) Gaurav, 10) JRF-1, 11) JRF-3, 12) JRF-4, 13) Pcl-16-2. Ten seeds of each variety of four Replication were exposed to biovi's seed image analyser to get the seed physical parameters. The seed length was ranged from 6.23 mm to 7.10 mm, seed width varied from 4.40 mm to 4.90 mm among the genotypes, seed length to width ratio ranged from 1.36 to 1.48 and 1000 seed weight varied from 5.34 g to 7.95 g varied among the linseed genotypes. The genotype Pratapalsi was having significantly highest seed length (7.10 mm), seed width (4.90mm), length / width ratio (1.45mm) and 1000 seeds weight (7.95 g) and Jrf-4 was having numerically less seed length of (6.23 mm), seed width of (4.59 mm), length / width ratio (1.36 mm) and 1000-seeds weight (5.44 g) Based on the seed length and seed width, the genotypes were characterized. And all linseed genotypes were seed colour was brown. All the genotypes showed significant variation with respect to seed physical parameters and the genotypes having more seed size with seed weight can be used in crop improvement programme to get good quality seeds for achieving good seed yield. Further the seed image analyser equipment can be very well used for screening varieties based on seed physical parameter which is a helpful for grading the seeds based on seed size and weight.

Keywords: linseed, image analyzer, seed quality

Introduction
Linseed or Flax (*Linum usitatissimum* L.) is a member in the family Linaceae. The name *Linum* originated from "lin" or "thread" and the species name *usitatissimum* is a Latin word meaning "most useful". It is also called flaxseed or linseed when it is used as oilseed and referred to as fiber flax or just flax (in Europe) when it is used for fiber (Vaisey-Genser and Diane, 2003) [19]. Linseed or flax is one of the oldest crops cultivated by man. Linseed is an annual herb with 6,000–7,000 years planting history. Flax is the third largest natural fiber crop and one of the five major oil crops in the world. It is important crop of tropical as well as temperate zone of the world. Based on diversity of plant types, linseed has two centers of origin i.e., South West Asia, particularly in India (Vavilov, 1935) [21] and the Mediterranean region of Europe (Darlington, 1963) [2]. it has been cultivated for several thousand years mainly for its seed oil and its high quality stem fibre. Long stemmed linseed produces a high quality fibre and short stemmed linseed bears larger seeds of high oil content. Characterization of varieties for purity testing as well as identification has attained much importance in seed production programme of almost all major crops. All sectors of seed industry benefit from the ability to assess cultivar purity and identity. Therefore, information on well-expressed and distinct characteristics of linseed genotypes should be made available to the seed producers and seed certification agencies in order to monitor the genetic purity both at field and seed stage. A number of techniques for seed quality evaluation and sorting are based on the detection of various physical and physiological properties of seeds and more recently,

the greatest efforts have focused on producing sophisticated non-destructive methods. Biovi's seed image analyser will help to capture the images very fast, process it and produce the results effectively, accurately and it takes very less time. It's non-destructive method for determining seed size profiles would greatly benefit the grain industries. Image analysis is a strong candidate for developing automated measurement system for seed Sizing. Keeping these points in view, a laboratory experiment was planned to analyze the differences in thirteen important linseed fibre genotypes characterized them for further usage in breeding programmes. The laboratory experiment was carried out to study the Characterization of linseed genotypes using seed morphometric characters in the Department of Seed Science and Technology, College of Agriculture, UAS, Raichur.

Materials and Method

The seed materials were collected from AICRP on linseed, PC Unit, Kanpur. The genotypes used for the study were 1) Jeevan, 2) Ruchi, 3) Pratapalsi 4) Parvati, 5) Meera, 6) Rashmi, 7) Shikha, 8) Nagarkot, 9) Gaurav, 10) JRF-1, 11) JRF-3, 12) JRF-4, 13) Pcl-16-2. The seed image analyser was used to measure length, width and shape of the seeds, where as 1000- seed weight was measured by using digital micro balance and seed colour by naked eye for classifying different linseed genotypes.

Biovis seed image analyser

Biovis is a seed image analyser of new generation, based on digital image processing technology, easy to handle and to operate (Plate 1). The device comprises a scanner, which will scan the images and capture the same with their length, width, area, perimeter and roundness with coloured images (Plate 2). Thus it is suitable for the analysis of the seeds of many crops. The Biovis seed image analyser provides clearly more than a traditional counting device. It works fast, noiseless and easily operated. The special Biovis image anlysis software offers a lot of possibilities, to adjust the recording of the analysis results and statistical interpretation according to the requirements and demands of the user. After irregularly distributing a seed sample on special measuring plane (image scanner), it will takes a picture of the objects to be explored is taken under optimal lighting conditions. This image is evaluated in the PC by a special software on the basis of the digital image processing. Seeds of different shape and size will be counted fast and reliably, the measurements of their length and width is determined as well as their size infractions. The features of varieties are stored in a pre-configured, able to learn database for recognizing and identifying main seeds, foreign seeds and non-seed particles. The analysis data are entered and reported together with user-selectable statistical information in a measuring protocol. Furthermore it is possible to transfer specific measuring data to a user-specific database.

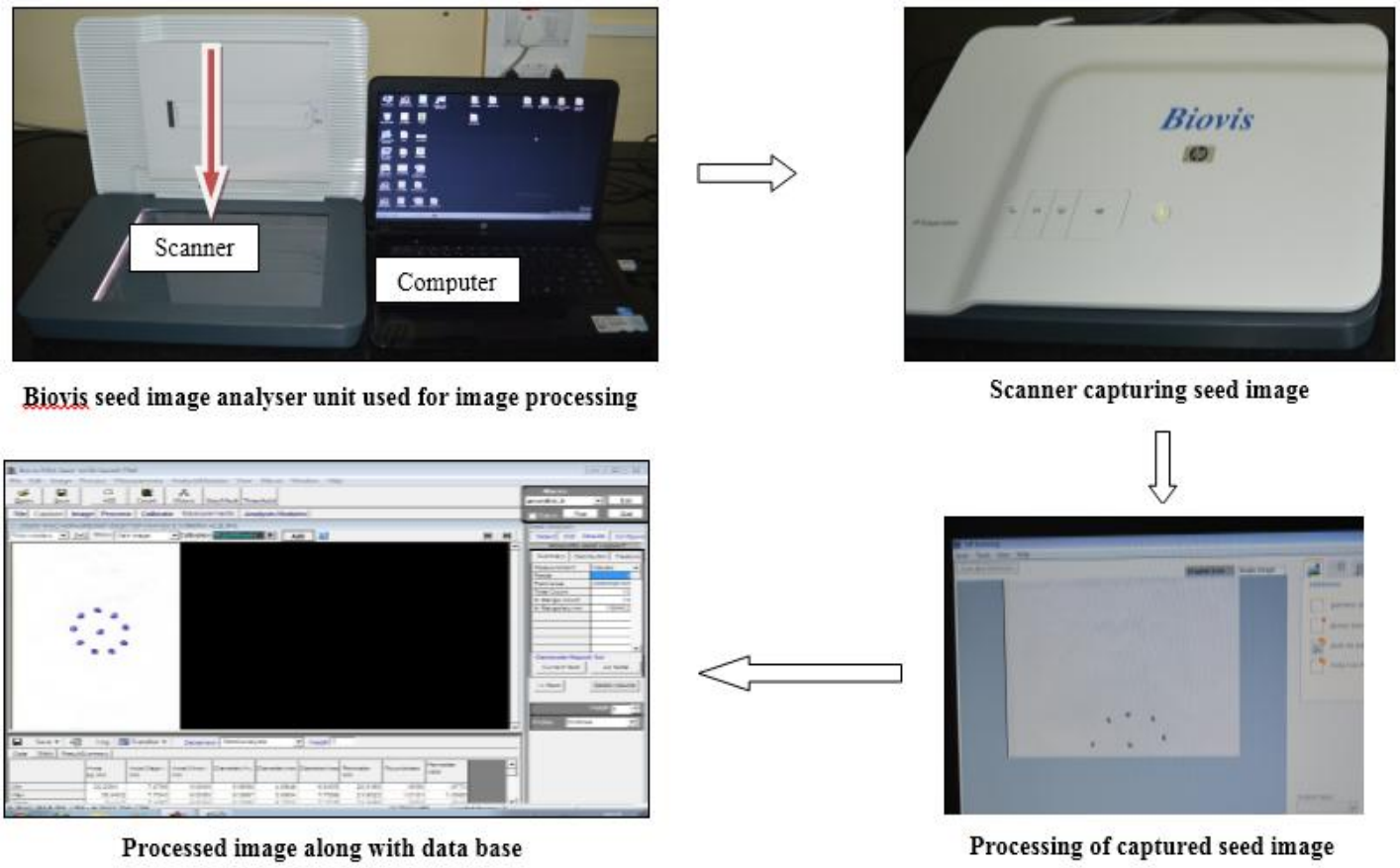

Plate 1: Seed image acquisition and data analysis by using Biovis seed image analyser

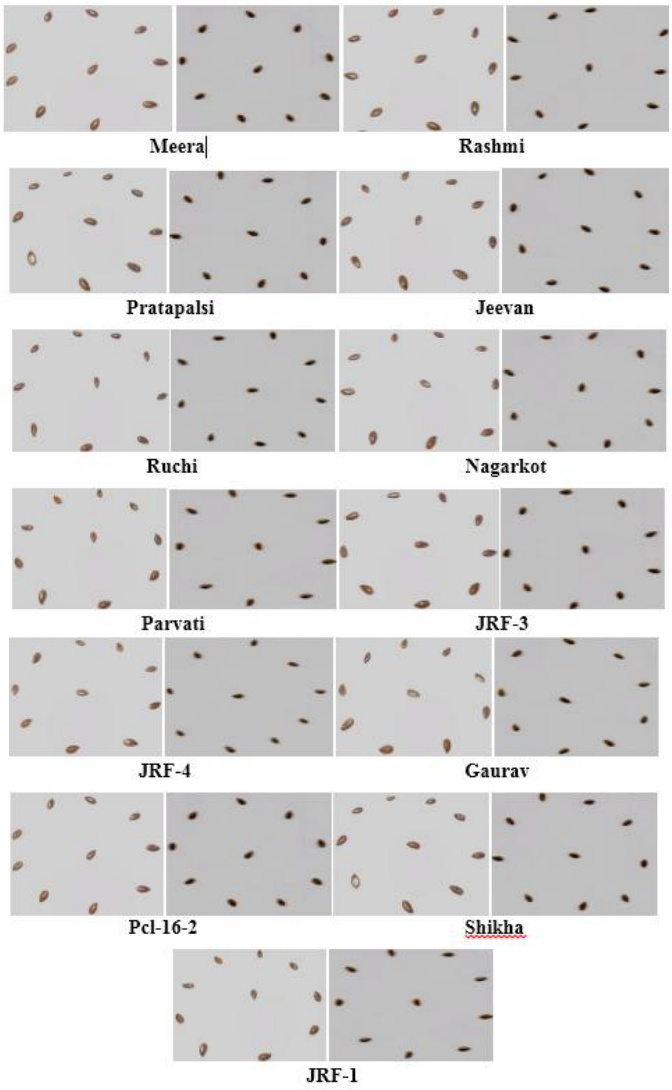

Plate 2: Images of different linseed fibre genotypes captured by digital camera and Biovis seed image analyser

Results and Discussion

Ten seeds of each variety of four Replication were exposed to Biovis seed image analyser to get the seed physical parameters. The seed length was significantly varied among the linseed genotypes. The seed length ranged from 6.23 mm to 7.10 mm. The longest seed length was recorded in Pratapalsi (7.10 mm) followed by Rashmi (6.94 mm). The shortest seed length was recorded in JRF-4 (6.23 mm). The seed width varied from 4.40 mm to 4.90 mm varied among the linseed genotypes. The longest seed width was recorded in Pratapalsi (4.90 mm) followed by Meera (4.83 mm) and shortest in JRF-1 (4.40 mm). Significant differences were observed among the genotypes for seed length / width ratio. The seed length per width ratio ranged from 1.36 to 1.48 the highest ratio was observed in Jeevan (1.48) and lowest in JRF-4 (1.36). The 1000 seed weight varied from 5.34 g to 7.95 g varied among the linseed genotypes. The longest 1000 seed weight was recorded in Pratapalsi (7.95 g) followed by Ruchi (7.73 g) and shortest in JRF-3 (5.34 g).Based on the seed length and seed width, the genotypes were characterized. And all linseed genotypes were seed colour was brown. All the genotypes showed significant variation with respect to seed physical parameters and the genotypes having more seed size with seed weight can be used in crop improvement programme to get good quality seeds for achieving good seed yield. Further the seed image analyser equipment can be very well used for screening varieties based on seed physical parameter which is a helpful for grading the seeds based on seed size and weight the genotypes were characterized and it will be helpful during processing to identify good quality of seeds. This characterization was based on the classification of linseed varieties earlier by Negash *et al*. (2015) [9]. Similar results were reported by Paulsen *et al.* (1989) [12] in maize, Zayas *et al.* (1989) [23] in wheat, Manjunath Reddy, (2005) [6] in cotton, Vijaya Geetha *et al.* (2011) [22] in mustard and Janka Nozkova *et al.* (2014) [5] in linseed. Hector *et al*. (1934) [4], Rosta (1975) [14], Sivasubramanian and Ramakrishnan, (1978) [16] and Vanangamudi *et al*. (1988) in rice, Paukens (1975) [11] and Nagapadma *et al*. (1996) [8] in maize; Arunkumar *et al*. (2004) [1] in pearl millet; Thangvel *et al*. (2005) [18] in sorghum. Though, the seed colour is genetically controlled characteristics, but it is also influenced by the environment (Pascual *et al*. 1993) [10] and thus, leading to difficulty in classifying the genotypes on the basis of seed colour. Colour of seed is due to phytan content in the seed (Nagalaxmi *et al*. 2009) [7]. Similar study of image analysis has been carried out by Zayas *et al*. (1989) [23], Suchowilska and Wiwari (2006) [17], Dubey *et al*. (2006) [3] and Sainis *et al*. (2009) [15] in wheat and Paulsen *et al*. (1989) [12] in maize. As none of the seed can be treated as ideal due to influence of environment, so that, they could not help in identification of individual genotypes. The average of variation within character between the objects of optimum sample size can be taken as a reliable character descriptor (Keefe and Draper, 1990) which is very much beneficial for crop improvement programme.

Table 1: Characterization of genotypes based on seed morphology using seed image analyser

Genotypes	Seed length (mm)	Seed width (mm)	Seed length / width ratio	1000 Seed weight (g)
Gaurav	6.77	4.82	1.41	6.77
Jeevan	6.72	4.55	1.48	6.06
JRF-1	6.36	4.40	1.45	5.88
JRF-3	6.35	4.52	1.41	5.34
JRF-4	6.23	4.59	1.36	5.44
Meera	6.82	4.83	1.41	7.14
Nagarkot	6.63	4.63	1.43	5.83
Parvati	6.73	4.82	1.40	7.11
Pcl-16-2	6.77	4.82	1.40	7.13
Pratapalsi	7.10	4.90	1.45	7.95
Rashmi	6.94	4.72	1.47	6.73
Ruchi	6.82	4.67	1.46	7.73
Shikha	6.81	4.68	1.45	6.95
Mean	6.70	4.69	1.43	6.62
SEm±	0.04	0.03	0.02	0.02
CD at 1 %	0.17	0.15	0.04	0.11

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