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VARIABILITY FOR FORAGE YIELDING TRAITS IN EXOTIC GRASS PEA (*LATHYRUS SATIVUS* L.)

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SUMMARY

Eighteen exotic accessions of high biomass grass pea were evaluated for green forage and dry matter yield potential in Jhansi, Bundelkhand region of U. P. High magnitude of variability was observed for the eight qualitative traits viz., growth habit, leaf colour, flower colour, anthocyanin pigmentation, pod and seed shape, colour and size, and eight quantitative traits viz., plant height, primary and secondary branches, nodes/plant, leaves/plant, green forage, dry matter yield and protein content. Out of the 18 accessions, four were found promising for green fodder yield, three for dry matter yield, four for high number of branching pattern, three for good plant height, two for more number of leaves and nodes per plant and three for red flower colour. However, protein content has not shown much promise to select the promising lines.

Key words : Accessions, green forage yield (GFY), dry matter yield (DMY), variation, *Lathyrus sativus*

Lathyrus sativus (L.) is one of the ancient crops used by man in Asia, Africa, Europe and South America. The major use of *Lathyrus* includes pasture crop, green fodder, dried stover, seeds as feed and as human food (Kumar, 1997). In south Asia, Ethiopia and China, the crop is dual purpose and in other region it is mostly used as fodder and feed. Some minor uses of *Lathyrus* are green manure, perfume and ornamental plant. Among all *Lathyrus* species, *L. sativus* appears to be the highest producer of biomass and grain (Jackson and Yunus, 1984). Being very hardy crop it can withstand the extreme environmental and changing climatic conditions. Therefore, the species is ideal for feeding the cattle in grazing as well as stall-feeding and preferred by the farmers (Campbell, 1994). *Lathyrus* has potential in maintaining non-indigenous diversity in rangelands where it is not possible to have re-seeding with original vegetation and where it could well fit into a mixed vegetation system in harmony with existing ecosystem (Padulosi and Adham, 1997). The primary goal of grazing-based forage systems is to provide year-round high-quality forage and reduce the use of expensive stored forage or purchased feeds. However, it is also useful in maintaining the ecosystem diversity in agricultural systems. Hence, study was conducted to evaluate the morphological variation using 18 exotic accessions in order to determine the extent of diversity in the accessions of the cool season legume *Lathyrus sativus*.

MATERIALS AND METHODS

The material consisted of 18 accessions viz., EC539021, EC 539023, EC 539025, EC 539026, EC 539027, EC 539030, EC 539032, EC 53903361, EC 539037, EC 539013, EC 5390131, EC 5390202, EC 5390311, EC 539034 along with check nirmal was grown in RBD with three replications at CR Farm, IGFRI, Jhansi during **rabi** 2009-10 and 2010-11. The plot for individual accession comprised three rows of 4 m length with intra and inter row spacing of 15 and 30 cm, respectively. Morphological observations were recorded at 50 per cent flowering stage on eight qualitative traits and eight herbage yield attributes from five randomly selected plants. Observations were recorded on eight qualitative traits viz., growth habit, leaf colour, flower colour, anthocyanin pigmentation, pod and seed shape, colour and size, and eight quantitative traits viz., plant height, primary and secondary branches, nodes/plant, leaves/plant, green forage and dry matter yield and protein content. Differential response of accessions for GFY, DMY and herbage yield attributes was observed using graphical representation of data and promising accessions were selected for critical evaluation for identification of suitable lines for forage.

RESULTS AND DISCUSSION

Out of the 18 accessions, 16 (88.9%) were spreading type and two (11.1%) were semi-spreading type; 15 (83.3%); 17 (94.4%) were pigmented type and one (5.6%) was green leaves; 15 (83.3%) were blue and three (16.7%) were red flowered; 12 (66.7%) were pigmented type stem, while six (33.3%) were found not pigmented type and 13 (72.2%) accessions were round pod shaped, whereas 5 (27.8%) were flat pod type. However, seed size and seed colour (speckled gray) was less variable and seeds of all the accessions were noted as of rhomboid shape. This suggests that the seed size is a more stable trait in the tested grass pea lines which have shown a good potential to respond better in favourable growing conditions; similar results were reported by Polignano *et al.* (2009). One can postulate that the forms with blue flower and speckled seeds were more primitive and the pattern of variation found in *L. sativus* was similar to that found in other legumes such as lentil and faba bean (Jackson and Yunus, 1984).

A comparative assessment of quantitative characters was done using graphical methods to identify the good source of green forage as well as dry matter yield. The analysis of Fig. 1 reveals considerable genetic diversity among the exotic accessions of *L. sativus* for green forage and dry matter yield. Out of 18 accessions, accession no. EC 539031 showed highest green forage yield (GFY) followed by EC 539035 and EC 539020, whereas accession no. EC 5390202, EC 539021 and EC 5390361 showed low GFY. However, dry matter yield (DMY) was noted highest in accession no. EC 5390202 followed by EC 539031 and EC 539030 and low DMY was observed in accession EC 5390361 followed by EC 5390201 and EC 539032.

Forage yielding attributes, namely, plant height, number of primary branches, number of secondary branches, number of leaves/plant and nodes/plant directly contributed to green and dry forage production in *L. sativus* accessions but their level of contribution differed significantly as shown in Fig. 2. Herbage yield was highly influenced by number of leaves per plant followed by nodes per plant, plant height and secondary branches per plant, whereas primary branches per plant showed lowest contribution (Fig. 2). Similar kinds of results have been obtained by Polignano (2009). Fig. 3 reveals good variation for plant height and branching pattern. Accession no. EC 539026 exhibited maximum plant height followed by EC 5390131 and EC 539031, whereas EC 539038 exhibited lowest height followed by EC 5390361 and EC 539037. However, accession no. EC 539035 showed highest secondary branches followed by EC 5390201 and EC 5390361. On the basis of variation exhibited by different forage yield attributing traits, promising accessions were selected for systematic screening for forage yield in the next seasons so that selection could be made for good forage grass pea lines.

Table 1 shows the promising accessions where accessions EC 539031, EC 539035, EC 539034 and EC 5390201 for GFY; accessions EC 5390202, EC 539031 and EC 539030 for DMY; accessions EC 539035, EC 5390201, EC 5390361 and EC 539030 for good

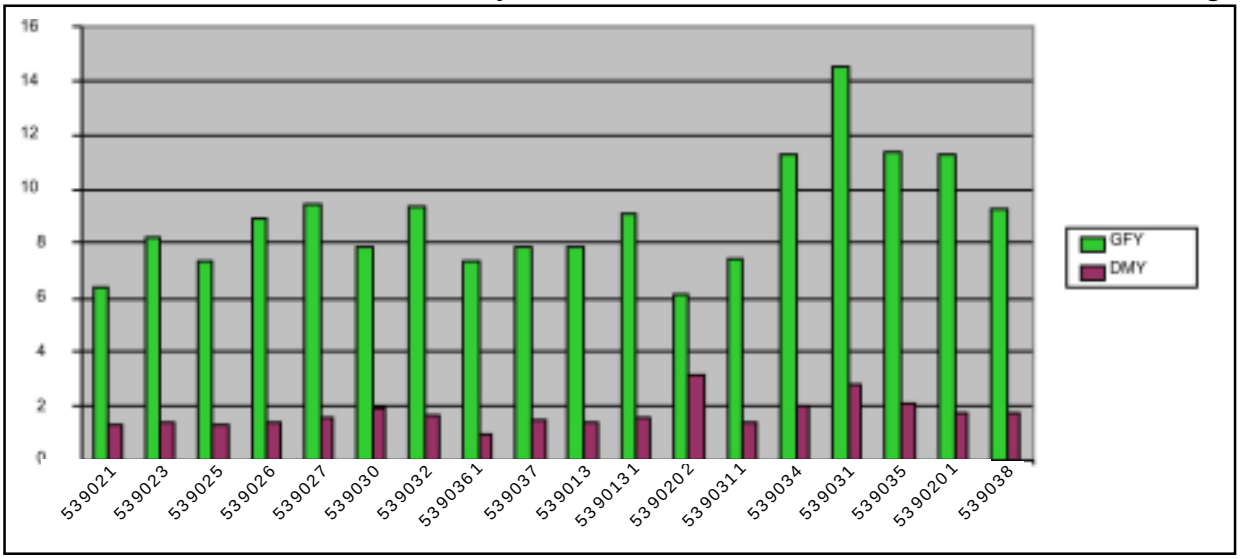

Fig. 1. Response of different accessions of *L. sativus* for GFY and DMY.

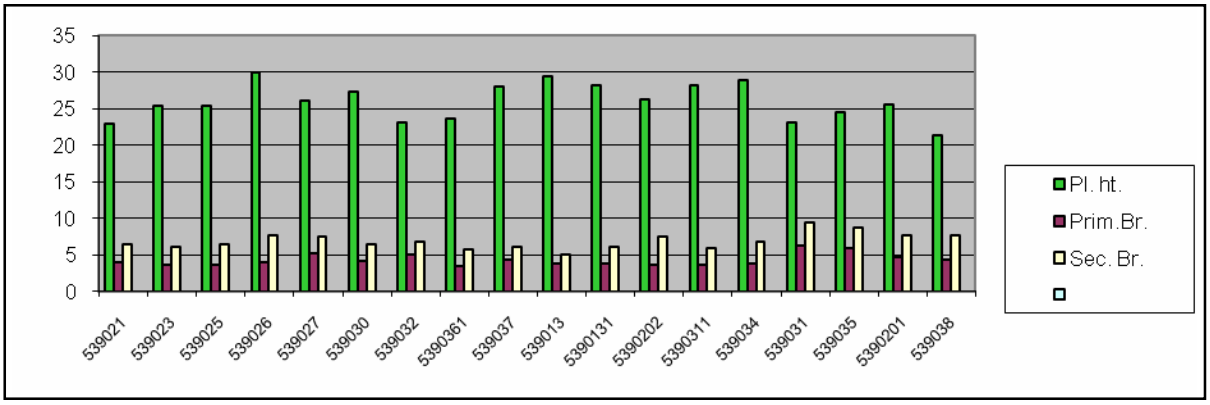

Fig. 2. Variation for plant height and branching pattern in different accessions of *L. sativus*.

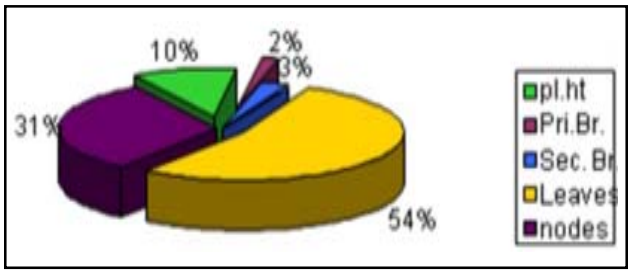

Fig. 3. Contribution of different traits for herbage yield in *L. sativus*.

branching pattern, accessions EC 539026, EC 5390131 and EC 539031 for tall plants and accessions EC 539035 and EC 5390201 for higher leaves and nodes per plant; accessions EC 539026, EC 539030 and EC 5390361 for red flower and accessions EC 539025, EC 5390361, EC 539013, EC 5390202 and EC 539034 were selected for green and flat pod shape. Overall two accessions viz., EC 539031 and EC 539035 were selected as most suitable lines for forage yield (Table 1).

The renewed interest of researchers and the lack of forage varieties in *Lathyrus* in India, we have used collected accessions as initial material for evaluation of good forage lines. The result showed that studied accessions have great variability for GFY and DMY (Singh *et al*., 2012). Marin *et al*. (2001) have observed similar results in grass pea populations. Rao *et al*. (2005) have also reported forage yield potential and high quality forage in grass pea lines as an alternative to fallow period in cropping system. Further, material used in the present study showed great morphological variation especially in vegetative characters such as plant height, leaves, nodes and secondary branches per plant. Jackson and Yunus (1984) have also reported good variability for vegetative traits particularly size of leaves in different *Lathyrus* species. This array of variation is undoubtly the result of geographical representation and adaptation of the plant.

The drawback to the use of this crop is the production of neurological disorders called lathyrism in man and domestic animals when the seeds are consumed in excess. However, information of â-ODAP content from local *Lathyrus* forage dry matter (DM) and straw is scanty. Efforts are underway to understand the toxin and genetic detoxification to develop low toxin lines which pose less threat to human and cattle.

TABLE 1
Promising accessions of *L. sativus* identified for important forage yield component traits

S. No.	Productivity traits	Promising accessions
1.	GFY	539031, 539035, 5390201
2.	DMY	5390202, 539031, 539030
3.	Plant height	539035, 539031, 5390361, 539030
4.	Branching pattern	539026, 5390131, 539031
5.	Leaves & nodes/plant	539035, 5390201
6.	Red flower colour	539026, 539030, 5390361
7.	Pod shape	539025, 390361, 539013, 390311, 539034

CONCLUSION

The promising *Lathyrus* accessions could be considered for systematic study for suitable lines for dual purpose and for variable adaptability. Genetical, ecological and biochemical research deserves extension of this species to the whole country to overcome the increasing leguminous food and forage demand.

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