



## Phenotypic markers for selection of ODAP content in grasspea seeds

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Continuous consumption of grasspea seeds is known to cause a neurological disorder called 'Lathyrism' which is characterized by a non reversible paralytic condition in lower limbs. The factor responsible has been identified as an amino acid called  $\beta$ -N-Oxalyl-L- $\alpha$ - $\beta$  Diamino Propionic Acid (ODAP) found in the seeds at a concentration of 0.5-2.5% dry weight [1]. It is of paramount importance and of practical significance to identify observable characters which would effectively describe ODAP level in the seeds of grasspea and would thereby serve as important phenotypic markers. Attempts were made to identify morphological markers such as flower colour and seed coat pigmentation for ODAP content to help selection for low ODAP. The results were not consistent [2]. The study was, therefore, undertaken to examine critically the relationships of different characters with ODAP content in the seeds of grasspea with a view to identify specific character(s) as an aid in selection for low ODAP.

Widely divergent nine genotypes were taken for the study. Of them Nirmal, Hoogly Local and Midnapur local were from West Bengal, India and P-24, P-28, P-90, P-505 and Sel 1276 were from Indian Agricultural Research Institute, New Delhi, while Exotic Bold was from Syria. The genotypes were grown in three consecutive years in a randomized block design with three replications maintaining 1m distance between the rows and 40 cm. between the plants. Seeds were sown in the third week of November and harvest was done in last week of March. Seed yield/plant (g), 100 seed weight (g), pods/plant, seeds/pod, seed protein content (%) and days to maturity were recorded along with ODAP content in seeds. Seed protein content was estimated following Micro kjedahl method. ODAP level in the seeds estimated by wet chemistry method [1].

The performance of nine genotypes for different characters pooled over the years and also ODAP content are given in Table 1. Exotic Bold and P-28

showed late maturity and took around 125 days after sowing. Except Exotic Bold others produced around 70 pods/plant, while it was around 20 in Exotic Bold suggesting very low pod yield in the genotype. Seeds/pod did not exhibit any appreciable variation which was around 4/pod in genotypes other than Exotic Bold in which 2-3 seeds/pod were recorded. Exotic Bold produced very large and bold seeds as it recorded 100 seed weight of 11 g which was well above others. Notwithstanding such bold and large seeds Exotic Bold consistently produced lowest seed yield/plant over the years due to poor pod production. Variable seed protein content ranging from 25-30% was recorded. Seed protein estimate of P-505 and P-28 was 30 and 28% respectively which closely agreed that of Mehra *et al.* [3]. Significantly Exotic Bold displayed seed protein content close to 29% which was very high in comparison to many other genotypes. Seed protein content in Lathyrus averaged over the genotypes was around 27% which by and large supports the earlier observation of Gopalan *et al.* [4] and Bel [5] indicating higher seed protein yield than other pulse legumes. ODAP content in the seed of different genotypes displayed a good deal of variation ranging from 0.15 to 0.36% (Table 1). P-28 and Exotic Bold according to present estimates constituted the group exhibiting lowest level of ODAP in seeds. Other than Hoogly Local and P-505, five other genotypes (Nirmal, P-24, Sel 1276, P-90 and Midnapur Local) recorded little above 0.3% ODAP content, which supports the observations of Mehra *et al.* [3] and Sharma [6] for P-28, P-505, P-24 and Nirmal. The correlations between ODAP level and other six plant characters (Table 1) showed that 100 seed weight was significantly and negatively correlated as observed by Sharma *et al.* [7] indicating larger and bold seeds might have lower ODAP content. Interestingly Exotic Bold recorded maximum 100 seed weight (Table 1) indicating very large seed size but also it had very low level of ODAP. While Nirmal with lower 100 seed weight registered

**Table 1.** Performance <sup>+</sup> of different genotypes of grasspea, their ODAP content and the correlations of ODAP with six different characters

Genotypes	Flower colour	Seed colour	Days to maturity	Seed yield/ plant (g)	100 seed weight (g)	Pods/ plant	Seeds/ pod	Protein Content (%)	ODAP (%)
Nirmal (W.B.)	Blue	Brownish-grey	118.77	17.84	7.12	72.06	4.14	25.16	0.36
Hooghly local (W.B.)	Blue	Grey	116.53	16.14	6.21	73.57	4.34	26.60	0.26
Midnapur local (W.B.)	Blue	Grey	115.33	16.45	6.17	71.24	4.26	27.26	0.31
P-24 (IARI, N. Delhi)	Blue	Grey	118.79	16.47	6.45	70.91	4.09	25.14	0.32
P-28 (IARI, N. Delhi)	Pink	Brownish (deep)	125.20	20.97	8.30	74.93	4.24	28.02	0.15
P-505 (IARI, N. Delhi)	Blue	Brownish-grey	123.40	18.29	8.87	70.75	4.17	29.84	0.26
P-90 (IARI, N. Delhi)	Blue	Brownish-grey	123.78	20.90	9.16	72.78	4.19	24.55	0.26
Sel 1276 (IARI, N. Delhi)	Blue	Brownish-grey	123.29	18.41	8.23	35.71	4.13	30.07	0.32
Exotic Bold (Syria)	White	White	125.63	5.97	11.03	19.64	2.84	28.97	0.17
Correlation (r) with ODAP	-	-	0.302	0.312	-0.69 <sup>+</sup>	0.47	0.46	-0.45	-

<sup>+</sup>Significant at 5% level, + Observations over the three years

highest level of ODAP content. Similar was the case with P-24, Midnapur Local and others. It would thus appear that larger seed size may result in the drop in ODAP level. In this context it is to be noted that Exotic Bold is a white seeded and white flowered genotype, while P-28 is pink flowered and deep brown seeded. Interestingly both these genotypes displayed distinctly larger flower size [8] and both of them had very low level of ODAP. To what extent such specific flower size, flower and seed colour and also seed size would likely to influence the ODAP content, warrants very critical deliberation. As correlation may vary from one population to another, the said characters may be treated as selection criteria for low ODAP for the population under study. If the present observations hold good in several other sets of grasspea populations grown under different variable agroclimatic situations such morphological characters would help selection of grasspea genotypes with significantly lower level of ODAP in seeds.

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