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Short Communication

Potential of amphidecaploid and its derivatives for quantitative traits in advanced generations of interspecific cross of *Avena sativa* L. × *A. maroccana* Gdgr.

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Oats are distinct among cereals due to their relatively high lysine rich protein content [1]. Oats are used as food, feed and fodder throughout the world. The genus incorporates diploid, tetraploid and hexaploid species based on basic chromosome number of x = 7. Various species differ in morphological, physiological and growth attributes. The efficient exploitation of wild gene pool to increase the genetic variability of cultivated oat crop (*Avena sativa*) is conditioned by recognition of genetic relationship between the cultivated and wild plants. *Avena sativa* L. and the wild species of the genus, *A. maroccana* Gdgr. are cytogenetically and morphologically closer to each other [2-4]. Some economically important traits as high protein content large grain size and profused tillering makes *A. maroccana* a potential source of useful traits for oat improvement programme.

The objective of the present study was to identify the promising polysomic progenies with respect to yield contributing characters in A_{14}-A_{16} generations as compared to the parental lines, with emphasis on better parent.

The material of the present study comprised of A_{14} to A_{16} progenies of amphidecaploid *A. sativa* (UPO 94) × *A. maroccana* Gdgr developed by Choubey *et al.* [4]. The original cross *A. sativa* UPO-94 (2n = 6x = 42) × *A. maroccana* (2n = 4x = 28) was attempted in Oat improvement programme of Indian Grassland and Fodder Research Institute (IGFRI) way back in 1985 followed by chromosome doubling [4].

The plant progenies were observed for plant height, number of tillers, number of leaves/main tiller, flag leaf length and width, largest leaf length and width, leaf sheath length and internode length along with some qualitative characters like, number and nature of awns, spikelet separation, lemma hairiness and colour along with the parental lines. Chromosome counts were made at meiosis following standard procedures.

In an entire array of progenies of the amphidecaploid in 14th generation numerical chromosomal variation was detected namely progenies with 2n = 44, 46, 50, 60, 62, 64 and 66 chromosome numbers apart from true amphidecaploid progenies showing 2n = 10 x = 70 number of chromosomes. The stability of these polysomics was confirmed in A_{15} and A_{16} generations [5]. Uniform progenies were selected based on minimum intra-progeny coefficient of variation. In order to utilize a particular progeny in an efficient breeding programme the improvement in individual traits was assessed *vis-a-vis* parents using statistics for difference in means computing as 't', a measure of significance [6].

Results indicated that the amphidecaploid and some of its derivatives with deficient number of chromosomes, by and large, trailed behind the better performing parental line for number of tillers per plant, longest leaf width, number of leaves per plant and plant height. A transgression for leaf characters, however, could be visualized in an array of derivatives of amphidecaploid. Progeny means for longest leaf length in 2n = 7x + I = 50 and 2n = 9x + 3 = 66 derivatives showed significant improvement over *Avena sativa*, a better parent for this character. Similarly, an amphidecaploid derivative progeny, 2n = 8x + 6 = 62, showed promise for flag leaf width (cm) as compared to that of better parent, *A. sativa*, as the progeny excelled the better parent by 0.59 cm and 't' value, 3.018, was noticed to be significant for the differences in means (Table 1). The results are in accordance to the reports [7] for getting improvement for some agronomic characters in the interspecific crosses of *A. sativa* × *A. sterilis*. Entire gamut of observations essenced an important conclusion that the disturbed ploidy level from amphidecaploidy downwards showed improvement for a few agronomic traits but overall a reduced potential was evident more frequently. In both

Table 1. Potential of progenies of an amphidecaploid and its derivatives in an interspecific cross of *Avena sativa* (2n = 6x = 42) × *A. maroccana* (2n = 4x = 28)

S. No.	Character	Chromosome number of amphidecaploid and its derivatives								P_1	P_2
		44	46	50	60	62	64	66	70		
1.	Plant height (cm)	6.87	−9.57	18.38	−0.3	2.68	−11.89	−7.07	−23.32	0.00	−74.12
		(0.923)	(0.962)	(2.435)	(0.030)	(0.224)	(1.402)	(0.693)	(2.290*)	**129.45**	(8.856)
2.	No. of tillers/plant	−13.26	−11.26	−4.73	−14.08	5	−12.62	−4.96	−9.33	−11.00	0.00
		(4.968***)	(2.954*)	(0.663)	(4.417***)	(0.630)	(4.192***)	(0.767)	(2.523*)	(3.053*)	**26.83**
3.	No. of leaves/plant	−0.28	−0.48	−0.43	0.42	0.17	−0.12	−0.96	−0.46	0.00	−1.83
		(0.637)	(1.398)	(1.087)	(0.621)	(0.555)	(0.282)	(2.297*)	(1.185)	**7.33**	(5.961***)
4.	Flag leaf length (cm)	−3.55	1.67	5.06	−7.33	−1.78	−6.06	−1.31	−9.17	0.00	−28.68
		(0.852)	(0.380)	(0.899)	(1.632)	(0.265)	(1.528)	(0.267)	(1.935)	**36.23**	(5.999***)
5.	Flag leaf width (cm)	0.31	−0.29	0.12	−0.09	0.59	−0.08	0.07	−0.25	0.00	−1.56
		(1.279)	(1.411)	(0.682)	(0.525)	(3.018*)	(0.529)	(0.411)	(1.274)	**2.31**	(16.695***)
6.	Leaf sheath length (cm)	2.57	2.2	1.77	−2.72	0.73	−0.03	−0.06	−1.01	0.00	−9.87
		(1.987)	(1.066)	(1.157)	(1.180)	(0.186)	(0.016)	(0.041)	(0.552)	**19.58**	(5.823***)
7.	Longest leaf length (cm)	4.72	−2.35	14.95	−2.69	5.12	7.63	8.97	7.17	0.00	−24.86
		(1.269)	(0.363)	(3.381**)	(0.697)	(0.927)	(2.048)	(2.302*)	(1.930)	**46.06**	(9.102***)
8.	Longest leaf width (cm)	−0.53	−0.43	−0.31	−0.35	0.09	0.17	−0.01	−0.25	0.00	−1.23
		(2.384*)	(2.307*)	(1.431)	(2.239*)	(0.425)	(0.808)	(0.064)	(1.403)	**2.41**	(11.637***)
9.	Internode length (cm)	−0.37	0.71	0.72	−1.48	−2.4	−0.3	−1.0	−2.09	0.00	−5.64
		(0.209*)	(0.369)	(0.290)	(0.594)	(0.689)	(0.111)	(0.529)	(1.230)	**19.80**	(3.144*)

NB: 1. Figures outside and inside the parenthesis represent (Pm-Pi) and 't' values respectively, whereas Pm indicates progeny mean and Pi, mean of the better parent; 2. Bold figures indicate mean of the better parent mentioned in the column for a particular character. P_1 indicates *Avena sativa* and P_2 *A. maroccana*; 3. *,** and *** indicate significant at 0.05, 0.01 and 0.001 level of probability.

the cases, however, a definite correspondence between improvement of an agronomic trait or reduction of potential thereof and ploidy level may hardly be established from the present observations. Nonetheless, it appears imperative to trap the derivatives showing certain improvement for a character and use them further in oat breeding. Besides, polysomic analysis enables to identify a major gene or a block of genes to have been situated at a particular chromosome. The derivatives of an amphidecaploid, thus, provided unique opportunity to establish chromosome-gene relationship and in turn their use in breeding programme. The present investigation concluded that the derivatives of amphidecaploid with chromosome number 2n = 7x + 1 = 50, 2n = 9x + 3 = 66 and 2n = 8x + 6 = 62 were important as they showed increased potential for leaf characters which may prove an asset in the pathway of achieving a milestone in the enhancement of biomass accomplished with increased potential of leaf/stem ratio and protein content in forage oat-improvement. It may be emphasized that all the above mentioned three races maintained stability over three generations i.e., A_{14}-A_{16}.

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