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Research Article

Studies on Heterosis and Transgressive Segregantion for Fodder and Grain Related Traits in Oat (*Avena satival*)

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ABSTRACT

A trial was conducted to Studies on heterosis and transgressive segregants for fodder and grain related traits in Oat (Avena sativa L.) in a diallel cross set of 8 parents, 28 F_{1s} and 28 F_{2s} oat were evaluated in randomized complete block design with three replications. The genetic parameters estimated for the traits based on mean performance, narrow sense heritability and genetic advance. The high heritability coupled with high genetic advance was observed for green fodder yield, dry matter yield and plant height in both the generations. High heritability with moderate genetic advance was found for days to 50 % flowering, seed per panicle, hecto lit. Grain weight and groat % in both generation indicating that selection in later generations would be much rewarding.

Key words: *Generation, Grand mean Heritability (narrow sense) and Genetic advance in per cent of mean.*

INTRODUCTION

The oat is grown in several parts of India and abroad. It is mainly grown in *rabi* season mostly for fodder, however, of late, its grain is being used as baby food, breakfast food and animal feed. Oat is a versatile grain for food, animal feed and non food products due to its unique grain qualities compared to other cereal grains. India possesses a large bovine population which includes 200 million cattle and 92 million buffalo. This accounts for 19.5 percent of the global cattle population. Despite this large bovine population, the scenario of milk production and productivity is far below the world average. It encompasses the phenotypic variance attributable to genetic causes which have a predictive function in plant breeding leading to permanent genetic improvement. The knowledge of heritability establishes appropriate selection methods coupled with the prediction of any gains from selection, and also help to establish the magnitude of the genetic effects.

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Larger genotypic variance is most preferred given that high heritability value can be obtained with genotypes with either small or large genetic progress. High heritability is associated with additive gene effect whereas low heritability is due to dominance and epistasis. The coefficient of variance shows that extent of variability represented by the different characters but it excludes the heritable portion.

MATERIAL AND METHODS

Basic material of the trial was taken on the basis of morphological differences for various characters in genotype from the genetic stock of oat. Genetic stock of oat maintained through natural self pollination of section of rabi cereal, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. Each parent F_{1s} and F_{2s} treatment was sown in RBD (RANDOMIESD BLOCK DESIGN) in single and double rows of 3m length along with row to row and plant to plant spacing of 22.5 cm and 5 cm, respectively. Recommended package of practice was applied to raise healthy crop. The data was recorded for days to 50 % flowering, days to maturity, plant height (cm), number of tillers per plant, spike length (cm), number of leaves per plant, leaf length, leaf width (cm), leaf: stem ratio, total chlorophyll, green fodder yield (g), dry matter yield (g),seed weight per panicle (g), seeds per panicle, harvest index, grain yield per plant (g), teat weight (g), crude protein, hecto liter grain weight, grain protein per cent, groat %, ease to dehulling, grain colour brightness, mean groat mass, groat length and width, leaf waxiness, leaf rolling, leaf area index, green area index, pollen viability index, heat susceptible index, membrane stability index mean data were used for statistical analysis.

RESULTS AND DISCUSSION

Estimation of heritability and genetic advance is the prime impotence in any selection programme which solely depends on additive genetic variance. The high heritability estimates were observed for all the characters in both generations. Higher estimates of heritability were also reported by earlier workers, Burton *et al.*[3] for these traits.

The heritability estimates in F_2 generation were comparatively higher than F_1 for all the characters except leaf: stem ratio, total chlorophyll, green fodder yield and green area index. Selfing of F_1s could improve the yield contributing characters and further improvement may be expected in advanced generation by suitable selection.

The high heritability coupled with high genetic advance was observed for green fodder yield and dry matter yield in both the generations similer result were obtained by Singh and Singh[11], Bibi *et al*.[1] and Shekhawat *et al.*[9]. Shanker *et al.*[8]. High estimate of heritability along with high genetic advance provide good scope for further improvement in advance generation.

Low Heritability	-below 10% percent
Medium Heritability	-10 to 30 percent
High heritability	-above 30 percent

Heritability was computed as per method suggested by Crumpacker and Allard in F_1 and Verhalen and Murray in F_2 generation. High heritability was observed all the characters in both the generations.

Genetic advance

Genetic advance as percent of means for each character was calculated as suggested by Johnson *et al.* For convenience following classifications were used for describing various parameters of variability in the text: **(table-1)**

Genetic advance	>20% High
	10-20% moderate
	<10% Low

In order to ascertain the relative merit of different attributes, genetic advance in percent of mean varied from 0.15 to 107.58 in F_1 generation. Characters like dry matter yield, green fodder yield in both the generations exhibited high genetic advance. Characters like days to 50 % flowering, seed per panicle, groat % exhibited moderate genetic advance while remaining characters show low genetic advance.

The high heritability coupled with high genetic advance was observed for two character dry matter yield, green fodder yield in both generations. High heritability with moderate genetic advance was found in days to % flowering, seed per panicle and groat 5 in both generation.

Grand mean, h, GA and GA in percentage over mean for 29 attributes in 8 parents diallel cross diallel cross in F_1 and F_2 generation of oat

Characters	X		h^2		GA		GA % over mean	
	F 1	F2	F1	F2	F1	F2	F1	F2
Days to 50% flowering	99.75	96.57	76.3	92.8	16.70	12.5	16.74	12.94
Days to maturity	137.83	134.93	70.3	88.9	9.61	7.51	6.97	5.57
Plant height (cm)	151.44	147.32	82.2	91.4	21.08	19.20	13.92	13.03
Tillers per plant	4.34	4.13	78.0	84.9	1.03	0.95	23.65	23.06
Spike length (cm)	31.53	29.84	32.1	63.5	1.66	1.28	5.26	4.30
Leaves per plant	22.49	21.17	73.5	88.6	4.54	4.90	20.18	23.15
Leaf lenght	56.12	54.95	82.5	87.6	5.26	3.70	9.37	6.73
Leaf Widht(cm)	1.72	1.65	58.0	89.0	0.15	0.15	8.54	9.04
Leaf stem ratio	0.33	0.31	67.3	60.7	0.04	0.01	12.01	3.94
Total chlorophyll	36.90	34.95	77.5	76.0	4.22	2.92	11.44	8.34
Green Fodder yield (g)	213.57	193.62	81.3	70.0	107.58	88.40	50.37	45.65
Dry matter yield(g)	80.33	71.12	86.3	94.2	48.03	37.92	59.78	53.32
Seed weight per panicle(g)	33.84	30.28	63.4	87.9	6.42	6.84	18.96	22.64
Seed per penicle(g)	95.47	93.02	69.9	91.0	10.76	9.32	11.27	10.02
Harvest index	41.84	39.63	76.2	81.7	4.91	4.48	11.74	11.30

Grand mean, h, GA and GA in percentage over mean for 29 attributes in 8 parents diallel cross diallel cross in F_1 and F_2 generation of oat

Characters	X		h^2		GA		GA % over mean	
	F1	F2	F1	F2	F1	F2	F1	F2
Grain yield per plant(g)	7.87	7.07	72.7	81.1	1.63	1.62	20.66	22.87
Test weight(g)	33.77	30.22	65.5	87.9	6.31	6.32	18.68	22.59
Crude Protein (cp)	11.65	10.83	78.5	87.4	1.95	2.04	16.74	18.82
H LGW (kg h/L)	49.24	46.48	76.7	90.5	10.29	9.20	20.89	19.79
Grain protien%	14.21	13.56	63.9	82.0	0.71	1.08	5.01	7.96
Groat %	50.62	48.17	79.2	86.3	10.52	10.15	20.78	21.06
Mean Groat mass	25.82	24.75	79.1	87.8	3.22	3.21	12.48	12.96
Groat lenght (mm)	7.72	7.61	81.3	90.3	0.49	0.50	6.38	6.55
Groat width (mm)	2.62	2.57	86.6	85.5	0.15	0.15	5.85	5.98
Leaf Area index (lai)	5.48	5.24	80.5	80.8	0.64	0.44	11.64	8.42
Green Area Index (gai)	6.24	5.94	82.8	81.8	1.03	0.81	16.55	13.61
Pollen viability Test	86.22	83.40	71.8	76.3	5.35	3.89	6.21	4.66
Heat Sussceptibility index (his)	1.06	0.93	83.9	90.8	0.50	0.43	47.23	45.64
Membrane stability index	35.56	34.21	76.7	83.6	4.05	2.74	11.41	8.01

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