Journal of Agroecology and Natural Resource Management
Print ISSN: 2394-0786, Online ISSN: 2394-0794, Volume 2, Number 2; April-June 2015 pp. 90-92

http://www.krishisanskriti.org/janrm.html

Correlation and Path Analysis Studies in Safflower

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Abstract—*The yield/plant was positively and significantly correlated with number of capitula/ plant, plant height, number of seed/capitula and 100 seed weight. Seed yield was also negatively correlated with height of insertion of first primary branch from ground level. Number of capitula/ plant inserted highest positive direct effect on seed yield/plant followed by number of seeds/ capitulum, plant height and 100 seed weight. The high residual effect of 0.578 indicate that there are some other characters, other than these which affect seed yield/plant and needed to be studied.*

1. INTRODUCTION

Safflower (*Carthamus tinctorius* L.) is an important multipurpose oilseed crop grown in Maharashtra and Karnataka. Its oil is important for health because of high polyunsaturated content and believed to be ideal for tropical cooking condition. Safflower oil has good dying property and therefore it is used in the manufacture of paints, varnishes and linoleum. The green safflower crop is also used as green fodder for cattle. The productivity of safflower is very low mainly due to lack of genetically improved cultivars with high yield and oil content. So information on path analysis and correlation coefficient between seed yield and yield component is pre-requisite for crop improvement.

2. MATERIAL AND METHODS

The present study was carried out at Oilseed Research Unit, Dr. P.D.K.V, Akola during rabi-2010. 150 germplasm lines obtained from Germplasm Management Unit, Solapur were planted in augmented block design in five blocks along with five released varieties as checks (Bhima, Manjira, A-1, JSF-1 and HUS-305) which are common for all blocks. Each genotype was sown as single row plot of 4m length with spacing of 45 cm between rows and 20 cm between plants. The observations were recorded on five randomly selected plants in each. The relation between seed yield and yield contributing characters in Safflower was worked out by correlation studies described by Panse and Sukhatme (1957) while path coefficient analysis was carried out according to methods suggested by Dew and Lu (1959).

3. RESULTS AND DISCUSSION

The direct and indirect effects of various quantitative characters on seed yield/plant were assessed through path analysis and are indicated in table no.1. The number of capitula/plant (0.511) had the maximum positive direct effect on seed yield/plant. This is followed by seed/capitula (0.386), plant height (0.208) and 100 seed weight (0.198). Subbalakshmi and Sivasubramanian (1995) and Sarang *et al.* (2004) also reported that the number of capitulum/plant exerted highest positive direct effect on seed yield while it`s positive indirect effect through primary branches/plant (0.395).

Table 1: Path matrix of seed yield in safflower

Character	Days to 50 % Flowering	Days to Maturity	Plant Height (cm)	Height of Insertion of 1st Primary branch	Primary Branches / Plant	No. of Capitula/Plant	Capitulum Diameter (mm)	Seeds/ Capitulum	100 Seed Weight (g)	Oil Content %
Days to 50 % Flowering	-0.11 76	-0.0 743	-0.0 48	-0.04 03	0.01 81	0.0212	-0.03 21	-0.0 412	-0.0 01	-0.0 04 6
Days to Maturity	0.09 38	0.1 483	0.0 68 6	0.04 53	-0.01 67	-0.0084	0.03 15	0.0 437	0.0 22 5	0.0 24 3
Plant Height (cm)	0.08 51	0.0 963	0.2 08 2	0.04 65	0.05 14	0.0443	0.08 39	0.0 583	0.0 50 7	0.0 18 6

Height of Insertion of 1st Primary branch	-0.04 16	-0.0 370	-0.0 27	-0.12 14	0.07 75	0.0662	-0.02 46	-0.0 263	-0.0 09	-0.0 032
Primary Branches/ Plant	-0.00 21	-0.0 015	0.0 033	-0.00 85	0.01 33	0.0103	-0.00 16	-0.0 026	0.0 008	0.0 004
No. of Capitula/Plant	-0.09 21	-0.0 291	0.1 088	-0.27 87	0.39 51	0.5111	-0.07 78	-0.0 859	0.0 140	0.0 020
Capitulum Diameter(mm)	-0.00 62	-0.0 048	-0.0 09	-0.00 46	0.00 27	0.0034	-0.02 26	-0.0 164	-0.0 05	-0.0 041
Seeds/ Capitulum	0.13 52	0.1 139	0.1 082	0.08 35	-0.07 65	-0.0649	0.28 03	0.3 863	0.0 250	0.0 893
100 Seed Weight (g)	0.00 17	0.0 301	0.0 483	0.01 39	0.01 22	0.0054	0.04 49	0.0 128	0.1 980	0.0 549
Oil Content %	0.00 21	0.0 086	0.0 047	0.00 14	0.00 16	0.0002	0.00 96	0.0 122	0.0 146	0.0 526
Seed Yield/ Plant(g)	0.05 83	0.2 504	0.4 657	-0.26 29	0.47 88	0.5888	0.29 14	0.3 411	0.3 111	0.2 304
Partial R^2	-0.00 69	0.0 371	0.0 970	0.03 19	0.00 64	0.3009	-0.00 66	0.1 318	0.0 616	0.0 121

Number of seeds/capitula shows significant positive direct effect on the seed yield followed by its indirect effect through capitulum diameter (0.280). 100 seed weight to some extent also shows positive direct effect on seed yield. In the present study only height of insertion of first primary branch from ground level (-0.121) and days to 50% flowering (-0.117) shows negative direct effect on seed yield. Malleschappa (1989) also reported that height of insertion of first primary branch is negatively associated with seed effect yield. But the negative direct effects are nullified by the positive indirect effect of number of seeds/capitula. The residual effect is very high i.e. 0.578 indicate that the characters under study contribute to just 42.16% only to the seed yield/plant. This indicates that there are some other characters which affect the seed yield. So these characters needed to be identify and included in the analysis to account full variation in the seed yield.

Table no.2 revealed that number of capitula/plant (0.588) is highly correlated with seed yield/plant. This is followed by number of primary branches/plant (0.478), plant height (0.465), seeds/capitulum (0.341) and 100 seed weight (0.311). The character height of insertion of first primary branch from ground level (-0.262) is negatively correlated with that of seed yield/plant. Number of capitula/plant also shows a good correlation with primary branches/plant. Plant height is correlated with capitulum diameter seeds/plant, days to maturity, number of primary branches/ plant and 100 seed weight. Capitulum diameter shows significant correlations with number of seeds/capitula. Height of insertion of first primary branch is negatively correlated with number of primary branches/plant and number of capitula/plant. While it`s significant positive association is found with days to 50% flowering, days to maturity and plant height.

Table 2: Correlation of yield with other yield component of safflower

Sr. No	Character	Days to 50 % Flowering	Days to Maturity	Plant Height (cm)	Height of Insertion of 1st Primary branch	Primary Branches/ Plant	No. of Capitula/Plant	Capitulum Diameter (mm)	Seeds/ Capitulum	100 Seed Weight (g)	Oil Content %
1	Days to 50 % Flowering	1.0000	0.6320	0.4088	0.3427	-0.1536	-0.1802	0.2734	0.3500	0.0085	0.0390
2	Days to Maturity	0.6320	1.0000	0.4625	0.3051	-0.1126	-0.0570	0.2127	0.2948	0.1518	0.1640
3	Plant Height (cm)	0.4088	0.4625	1.0000	0.2235	0.2471	0.2128	0.4030	0.2801	0.2437	0.0894
4	Height of Insertion of 1st Primary branch	0.3427	0.3051	0.2235	1.0000	-0.6387	-0.5454	0.2028	0.2163	0.0701	0.0261

5	Primary Branches/ Plant	-0.15 36	-0.1 13	0.24 71	-0.6 387	1.00 00	0.773 1	-0.11 83	-0.19 79	0.0 61 6	0.0 30 7
6	No. of Capitula/ Plant	-0.18 02	-0.0 57	0.21 28	-0.5 454	0.77 31	1.000 0	-0.15 22	-0.16 80	0.0 27 3	0.0 03 9
7	Capitulum Diameter(mm)	0.27 34	0.2 127	0.40 30	0.2 028	-0.11 83	-0.152 2	1.00 00	0.72 55	0.2 26 7	0.1 82 1
8	Seeds/ Capitulum	0.35 00	0.2 948	0.28 01	0.2 163	-0.19 79	-0.168 0	0.72 55	1.00 00	0.0 64 8	0.2 31 2
9	100 Seed Weight(g)	0.00 85	0.1 518	0.24 37	0.0 701	0.06 16	0.027 3	0.22 67	0.06 48	1.0 00 0	0.2 77 4
10	Oil Content %	0.03 90	0.1 640	0.08 94	0.0 261	0.03 07	0.003 9	0.18 21	0.23 12	0.2 77 4	1.0 00 0
11	Seed Yield/ Plant (g)	0.05 83	0.2 504	0.46 57	-0.2 629	0.47 88	0.588 8	0.29 14	0.34 11	0.3 11 1	0.2 30 4

The present study clearly revealed that the character number of capitula/plant, number of seeds/capitula, plant height and 100 seed weight has strong and positive association with seed yield and with each other. This indicates that the direct selection for these characters will enhance the breeding efficiency for seed yield in safflower.

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