



Identification and grouping of safflower genotypes through chemical tests

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Abstract

Characterization of varieties assumes greater importance with the implementation of Protection of Plant Varieties and Farmers' Rights Act. Grouping the varieties of minor oilseed crop like safflower based on seed and seedling response to various chemicals needs to be attended. Hence the study was taken up at University of Agricultural Sciences, Dharwad to identify safflower varieties with various chemical tests. Twenty genotypes of safflower were subjected to chemical tests using NaOH, KOH, GA₃ and 2,4-D. The seeds were soaked in NaOH (2%) and KOH (5%) solution for over night and the solution was decanted. Based on the colour of the solution, genotypes were grouped as light brown (7 genotypes), brown (9 genotypes) and dark brown (4 genotypes) in sodium hydroxide test and light brown (7 genotypes) and brown (13 genotypes) in KOH test. The germination papers soaked in 25 ppm GA₃ and 5 ppm 2,4-D, were used to test the seedlings response of these genotypes. Based on the response to GA₃ the genotypes were grouped as showing moderate response (4 genotypes), low response GA₃ the genotypes were grouped as moderate response (4 genotypes), low response (12 genotypes) and very low response (4 genotypes) and based on response to 2,4-D the genotypes were grouped as highly susceptible (1 genotype), susceptible (5 genotypes) and less susceptible (14 genotypes).

Key words: Characterization – safflower - chemical tests - groups

Introduction

Characterization of varieties assumes greater importance with the implementation of Protection of Plant Varieties and Farmer Rights Act. The variety can be identified through different traits. Chemical tests are quick, easy and reproducible. Grouping of the varieties of minor oilseed crop like safflower based on seed or seedling response to various chemicals needs to be attended. Hence the study was taken up at University of Agricultural Sciences, Dharwad (India) to identify the safflower genotypes with various chemical tests.

Material and Methods

Twenty genotypes of safflower were subjected to chemical tests using NaOH, KOH, GA₃ and 2,4-D. Ten seeds were washed in distilled water and then soaked in five ml of two per cent NaOH or five ml of five per cent KOH solution in test tube for over night at an ambient temperature. The solution was decanted and used for observation. Based on the change in colour of the solution, the genotypes were grouped as light brown, brown and dark brown under NaOH test and light brown and brown under KOH test.

For GA₃ and 2, 4-D tests, the seeds were surface sterilized by washing in distilled water. Fifty seeds each in three replications were placed on two layers of blotter papers moistened with 25 ppm GA₃ solution or 2 PPM 2,4-D and kept for germination by following ISTA procedure (Anon., 1996). The water soaked blotter papers were used as the control. On seventh day, the coleoptile length of twenty five randomly selected seedlings was measured and the growth response was recorded as per cent increased (for GA₃) or decreased (for 2,4-D) in coleoptile length over control.



Results

The genotypes exhibited varied response to chemical tests (Table-1 and Figure 1). On the basis of colour reaction with sodium hydroxide solution, the genotypes were grouped into three categories as light brown (seven genotypes), brown (nine genotypes) and dark brown (four genotypes). On the basis of colour reaction with KOH solution, the genotypes were grouped into two groups as light brown (seven genotypes) and brown (thirteen genotypes).

The varied coleoptile growth response of safflower genotypes to gibberlic acid (25 ppm) has been observed in the present study. Per cent increase in coleoptile length due to GA₃ varied significantly with the genotypes. It ranged from 1.9 per cent (AS-46) to 42.6 per cent (AS-2). Based on the differential growth response of coleoptile length to GA₃, the genotypes were grouped into three categories as very low response (<10 per cent), low response (10-30 per cent) and moderate response (>30 per cent). Among the genotypes, four genotypes showed very low response, twelve genotypes showed low response and four genotypes showed moderate response.

The genotypes showed varied response to 2,4-D application. Per cent decrease in coleoptile length due to 2,4-D varied significantly with the genotypes. It ranged from 72.7 per cent (AS-107) to 409.1 per cent (AS-39). Based on the per cent decrease in coleoptile length over control, the genotypes were grouped into three groups as less susceptible (< 200 %), susceptible (200-300%) and highly susceptible (> 300 %). Among the genotypes, 14 genotypes were less susceptible five were susceptible and one was highly susceptible.

Table 1: Characterization of safflower genotypes based on chemical tests.

Sl. No.	Genotypes	NaOH Test (2%)	KOH Test (5%)	Response to GA ₃ (25 ppm)	Response to 2, 4-D (5 ppm)
1.	A-1	Light brown	Light brown	Low response	Less Susceptible
2.	A-2	Light brown	Light brown	Very Low response	Susceptible
3.	A-300	Light brown	Light brown	Low response	Less Susceptible
4.	Nari	Light brown	Light brown	Very Low response	Susceptible
5.	AS-2	Light brown	Light brown	Moderate response	Susceptible
6.	AS-7	Light brown	Light brown	Low response	Susceptible
7.	AS-31	Light brown	Brown	Low response	Less Susceptible
8.	AS-36	Dark brown	Brown	Low response	Susceptible
9.	AS-39	Brown	Brown	Moderate response	Highly Susceptible
10.	AS-40	Brown	Brown	Very Low response	Less Susceptible
11.	AS-46	Brown	Brown	Very Low response	Less Susceptible
12.	AS-70	Brown	Brown	Low response	Less Susceptible
13.	AS-79	Brown	Light Brown	Low response	Less Susceptible
14.	AS-83	Brown	Brown	Low response	Less Susceptible
15.	AS-86	Dark brown	Brown	Low response	Less Susceptible
16.	AS-101	Brown	Brown	Moderate response	Less Susceptible
17.	AS-107	Dark brown	Brown	Low response	Less Susceptible
18.	AS-115	Brown	Brown	Moderate response	Less Susceptible
19.	AS-120	Dark brown	Brown	Low response	Less Susceptible
20.	AS-122	Brown	Brown	Low response	Less Susceptible

Discussion and Conclusion

The safflower genotypes exhibited varied response to the chemical tests. The seeds soaked in NaOH and KOH solutions reacted variedly based on the chemical compositions of the seed, which is determined by the genetic make up of the genotypes and hence variation in colour was observed (Chakrabarthy and Agarwal, 1990). The colour of the decanted solution varied from light brown to dark brown. Similarly, the response of genotypes in their coleoptile growth after the seeds were subjected to germination in the paper media soaked in GA₃ or 2-4, D was also varied based on the genotypes response to those chemicals. Some genotypes were less



responsive, where as, some were highly responsive. Hence, the extent of increases or decrease in growth of coleoptile to GA₃ or 2-4, D varied among genotype, These chemicals may leads to release of some other chemicals during germination, which may favour or inhibit the growth of the coleoptile (Sundaru, *et. al.* 1983; Vanderburg and Vanzwal, 1991). In conclusion, the chemical tests *viz.*, NaOH KOH, GA₃ and 2-4, D could be used for identification and grouping of safflower genotypes.

Table 2: Response of Safflower genotypes to GA₃ and 2,4-D

Genotypes	GA ₃ test	2,4-D test
	Per cent increase in coleoptile length	Per cent decrease in coleoptile length
A-1	19.5	100.4
A-2	9.5	222.0
A-300	22.3	140.3
Nari	2.1	274.0
AS-2	42.6	263.2
AS-7	8.6	282.0
AS-31	18.5	147.9
AS-36	13.1	269.4
AS-39	38.9	409.1
AS-40	9.1	181.0
AS-46	1.9	188.6
AS-70	28.7	150.0
AS-79	28.5	198.3
AS-83	21.0	143.3
AS-86	15.0	154.3
AS-101	40.9	120.0
AS-107	9.4	72.7
AS-115	30.4	87.3
AS-120	19.6	133.6
AS-122	23.3	144.6
CD (0.05)	1.3	4.8

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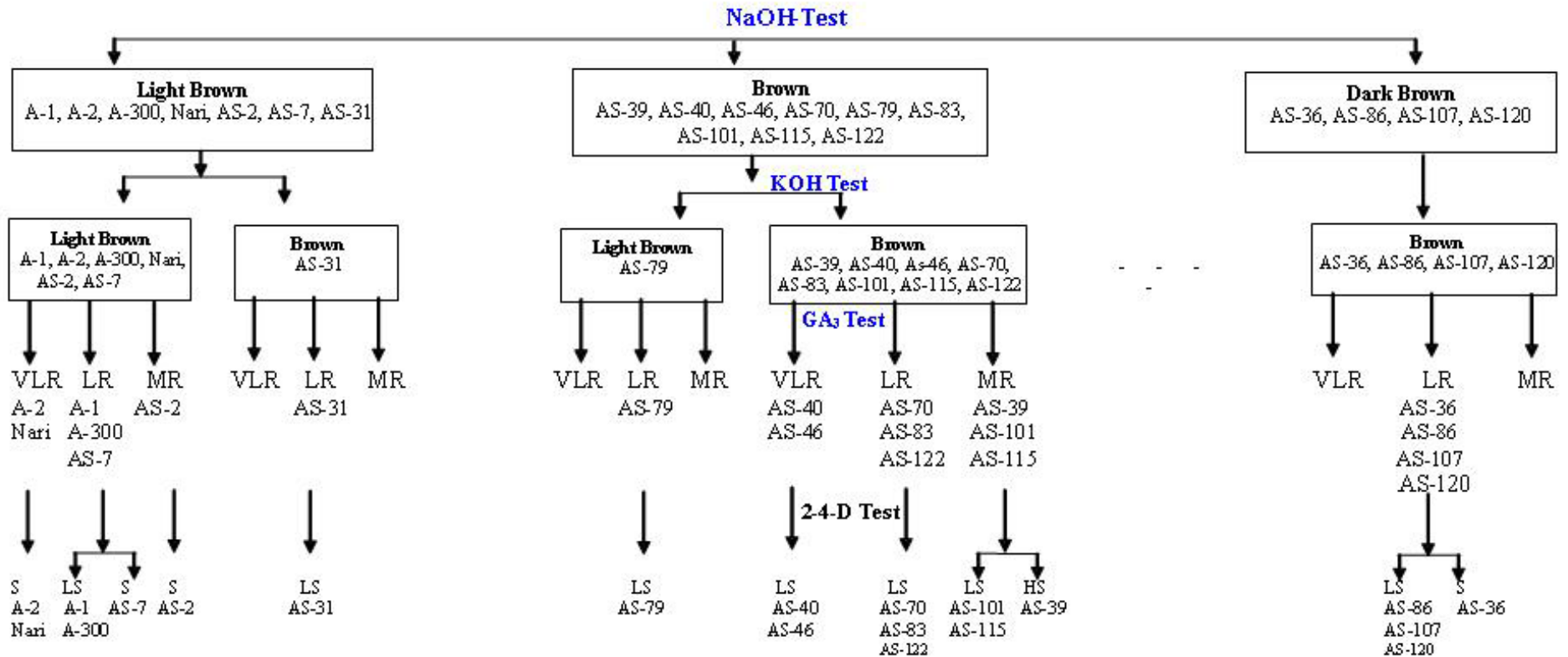
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References

- Anonymous, 1996. International rules for seed testing. *Seed Science and Technology*, **29**:1-335.
- Chakrabarthy, S. K. and Agarwal R.L., 1990. Identification of black gram varieties-III: utilization of seedling growth response to added chemicals. *Seed Research*, **18**(1):34-39.
- Sundaru, M., Baba, I., Tanabes, T., Tamai, F. and Matoda, Y., 1983. Varietal differences of Indonesian rice plants in their susceptibility to 2,4-D injury and inter-relationship with ethylene. *Japense Journal of Crop Sciences*, **52**(3):323-330.
- Vanderburg, N.J. and Vanzwol, R.A., 1991. Rapid identification techniques used in laboratories of the International Seed Testing Association: a survey. *Seed Science and Technology*, **19**:687-700.



Figure 1: Flow chart of grouping of safflower genotypes through chemical test



VLR – Very low response
LR – Low response
MR – Moderate response

LS – Less susceptible
S – Susceptible
HS – Highly susceptible