

Original Research Article

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## Selection Indices Studies in Ajwain (*Trachyspermum ammi* L. Sprague)

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### ABSTRACT

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Variability,  
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The present investigation entitled “Correlation and Path Analysis and Studies in Ajwain (*Trachyspermum ammi* L. Sprague)” was carried out with fifteen genotypes including three checks. The experiment was conducted in Randomized Block Design with three replication during *rabi* 2020-2021 at Chilli & Vegetable Research Unit, Dr. PDKV, Akola. The observations were recorded on five randomly selected plants for nine characters *viz.*, days to first flowering, days to 50 per cent flowering, days to maturity, plant height at maturity, number of primary branches per plant, number of umbels per plant, number of umbellates per umbel, test weight and seed yield per plant. The data so obtained was subjected to analysis of variance and selection indices study. In the present study, the mean performance of genotypes revealed a wide range of variability for all the characters. Significant highest mean values were recorded for seed yield per plant in genotype AKAJ-18-13-21 (7.62 g) followed by AKAJ-18-10-21 (7.16 g) and AA-2 (7.12 g). Genotypes *viz.*, AKAJ-18-13-21 and AKAJ-18-05-21 were found to be early maturing among experimental material. The selection indices studies indicated that the individual trait index, number of umbels per plant had the highest relative efficiency (101.507 per cent) indicated the importance of this trait as yield attribute. In this present investigation, selection index based on three characters (number of umbels per plant + number of umbellates per umbel + test weight) showing genetic gain (2.444) and relative efficiency (104.504 per cent) is more desirable and practically possible to use than those based on four or more characters.

### Introduction

Ajwain (*Trachyspermum ammi* L. Sprague) is an annual herb in the family of Apiaceae. Ajwain is a highly valued medicinally important seed spice. It is one of the most important and economical medicinal plants with a number of chromosomes  $2n = 18$ , that can be found in arid and semi-arid regions of Iran

for agriculture in conditions of water scarcity. It is also known as “Bishop Weed”. The minute grayish brown seeds or fruits of Ajwain are oval in shape.

The flowers are protandrous and cross pollination occurs through insect. It is a native of Egypt and is cultivated in Iraq, Iran, Afghanistan, Pakistan, and India. In India, it is cultivated in Gujarat, Rajasthan,

Madhya Pradesh, Uttar Pradesh, Maharashtra, Bihar and West Bengal. The total area and production of ajwain in India (2020) are about 37810 ha and 27920 T, respectively (NRC Seed Spices Ajmer, 2020).

The fruit possesses stimulant, antispasmodic and carminative properties and is used traditionally as an important remedial agent for flatulence, atonic dyspepsia, diarrhoea, abdominal tumours, abdominal pains, piles, bronchial problems, lack of appetite, galactagogue, asthma and amenorrhoea.

### Materials and Methods

The experimental material comprises of fifteen genotypes of ajwain *viz.*, AKAJ-18-02-21, AKAJ-18-03-21, AKAJ-18-04-21, AKAJ-18-05-21, AKAJ-18-07-21, AKAJ-18-08-21, AKAJ-18-09-21, AKAJ-18-10-21, AKAJ-18-11-21, AKAJ-18-12-21, AKAJ-18-13-21 and AKAJ-18-14-21 were collected from Chilli and Vegetable Research Unit, Dr. PDKV, Akola and 3 checks namely, AA-19-01, AA-2 and AA-93 were collected from NRCSS, Tabji, Ajmer, Rajasthan.

The experiment was conducted in Randomized Block Design at Chilli and Vegetable Research Unit, Dr. PDKV, Akola (Maharashtra) during *Rabi* season 2020-2021. Each genotype was sown in three replication with plot size 3 x 3 m<sup>2</sup> and spacing 60 cm x 45 cm.

The observation were recorded on five randomly selected plants of each genotype in each replication for nine characters *viz.*, days to first flowering, days to 50 per cent flowering, days to maturity, Plant height at maturity, Number of primary branches per plant, number of umbels per plant, number of umbellates per umbel, test weight and seed yield per plant.

However, days to first flowering, days to 50 per cent flowering and days to maturity were recorded on plot basis. Analysis of variance was done as per the methodology suggested by Panse and Sukhatme

(1985). Selection indices analysis was done according to the method outlined by Robinson *et al.*, (1951).

### Results and Discussion

Analysis of variance (Table 1.) revealed significant differences among the genotypes for all the traits studied indicating presence of variability in the material. The mean performance of the genotypes (Table 2.) revealed a wide range of variation for all the traits. The variation was highest for number of umbels per plant (56.67 – 111.07), plant height at maturity (70.67 cm – 110.27 cm), days to 50 per cent flowering (80.33 days – 107.00 days), days to maturity (121 days - 145 days) and days to first flowering (65 days – 90.00 days), while it was low for number of umbellates per umbel (8.93 – 14.33), seed yield per plant (3.90 g – 7.62 g), number of primary branches per plant (7.40 – 10.67), whereas test weight (0.59 g - 1.08 g) was found to be lowest in mean performance.

These findings of mean performance of various characters are also in agreement with findings of Subramaniyan *et al.*, (2018) and Rawat *et al.*, (2020) in ajwain indicating the large variation for yield and yield contributing characters.

The data presented in Table 3 indicated that the individual trait index, number of umbels per plant had the highest relative efficiency (101.507 per cent) indicated the importance of this trait as yield attribute. Similar results for single character indices were also reported by Hasan *et al.*, (2016) in chilli.

In two character combinations index consisting of number of umbels per plant and number of umbellates per umbel exhibited highest relative efficiency (103.304 per cent). This fact thus, underlined the importance of these characters in any selection programme. The index consisted of three characters *viz.*, number of umbels per plant, number of umbellates per umbel and test weight showed increased efficiency of 4.504 per cent over straight selection of seed yield.

**Table.1** Analysis of variance for the nine characters in ajwain

Source	Degrees of freedom	Mean sum of squares								
		Days to first flowering (Days)	Days to 50 per cent flowering (days)	Days to maturity (days)	Plant height at maturity (cm)	Number of primary branches per plant	Number of umbels per plant	Number of umbellates per umbel	Test weight (g)	Seed yield per plant (g)
<b>Replications</b>	2	2.4670	3.80	4.20	0.150	0.1130	6.4010	0.0810	0.0010	0.0390
<b>Treatments</b>	14	239.476**	249.676**	148.229**	431.249**	3.101**	860.338**	9.007**	0.077**	4.501**
<b>Error</b>	28	7.443	9.205	6.2	3.372	0.063	3.917	0.085	0.001	0.172

\* - significant at 5% level of significance.

\*\* - significant at 1% level of significance.

**Table.2** Mean performance of fifteen ajwain genotypes for nine characters

Sr. No.	Genotypes	Days to first flowering (Days)	Days to 50 per cent flowering (Days)	Days to maturity (Days)	Plant height at maturity (cm)	Number of primary branches per plant	Number of umbels per plant	Number of umbellates per umbel	Test weight (g)	Seed yield per plant (g)
1	AKAJ-18-02-21	84.33	102.33	135.33	72.53	8.40	61.53	11.40	0.73	4.13
2	AKAJ-18-03-21	71.67	88.67	128.33	82.80	9.47	83.07	9.60	0.73	4.94
3	AKAJ-18-04-21	74.33	92.33	129.67	89.47	10.33	94.67	14.33	0.86	6.36
4	AKAJ-18-05-21	65.33	84.33	124.67	79.13	9.20	65.87	10.53	0.87	4.44
5	AKAJ-18-07-21	85.00	102.67	140.00	80.67	9.13	68.00	13.13	0.69	4.27
6	AKAJ-18-08-21	85.00	100.67	142.00	90.33	10.53	87.93	13.13	0.86	6.13
7	AKAJ-18-09-21	87.33	105.67	141.67	89.27	9.47	83.33	9.67	0.71	4.96
8	AKAJ-18-10-21	83.00	100.33	138.33	101.47	10.40	97.60	12.20	1.04	7.16
9	AKAJ-18-11-21	71.00	86.67	130.00	77.60	9.60	87.33	8.93	0.82	5.40
10	AKAJ-18-12-21	73.33	90.67	128.33	72.53	9.13	72.67	14.00	0.62	5.03
11	AKAJ-18-13-21	65.33	80.33	121.00	110.27	10.67	111.07	12.07	1.08	7.62
12	AKAJ-18-14-21	65.00	83.33	130.33	81.20	7.40	64.27	9.40	0.68	4.04
13	AA-19-01	85.00	101.33	137.33	82.67	10.40	84.20	12.20	0.64	5.02
14	AA-2	69.33	84.67	130.00	104.87	10.53	109.87	12.53	1.04	7.12
15	AA-93	90.00	107.00	145.00	70.67	7.87	56.67	10.40	0.59	3.90
	<b>Mean</b>	77.00	94.07	133.47	85.70	9.50	81.87	11.57	0.80	5.37
	<b>SEm ±</b>	1.58	1.75	1.44	1.06	0.15	1.14	0.17	0.02	0.24
	<b>CD at 5%</b>	4.56	5.07	4.16	3.07	0.42	3.31	0.49	0.05	0.69
	<b>CD at 1%</b>	6.16	6.85	5.62	4.14	0.57	4.47	0.66	0.07	0.93
	<b>Minimum</b>	65.00	80.33	121.00	70.67	7.40	56.67	8.93	0.59	3.90
	<b>Maximum</b>	90.00	107.00	145.00	110.27	10.67	111.07	14.33	1.08	7.62

**Table.3** Expected genetic advance in seed yield per plant from the use of different selection indices and their relative efficiencies

Sr. no	Content of index	Expected genetic gain	Relative efficiency (%)
1	Days to first flowering	0.646	27.617
2	Days to 50 percent flowering	0.832	35.584
3	Days to maturity	0.758	32.421
4	Plant height at maturity	2.237	95.651
5	Number of primary branches per plant	2.055	87.837
6	Number of umbels per plant	2.374	101.507
7	Number of umbellates per umbel	1.026	43.871
8	Test weight	2.149	91.859
9	Seed yield per plant	2.339	100.00
10	Days to first flowering + Days to 50 percent flowering	2.159	92.295
11	Days to first flowering + Days to maturity	2.241	95.788
12	Days to first flowering + Plant height at maturity	1.312	56.085
13	Days to first flowering + Number of primary branches per plant	2.364	101.409
14	Days to first flowering + Number of umbels per plant	2.135	91.282
15	Days to first flowering + Number of umbellates per umbel	0.763	32.617
16	Days to first flowering + Test weight	1.455	62.217
17	Plant height at maturity + Number of primary branches per plant	2.331	99.654
18	Plant height at maturity + Number of umbels per plant	2.39	102.165
19	Plant height at maturity + Number of umbellates per umbel	2.289	97.839
20	Plant height at maturity + Test weight	2.287	97.765
21	Number of primary branches per plant + Number of umbels per plant	2.374	101.509
22	Number of primary branches per plant + Number of umbellates per umbel	2.055	87.853
23	Number of primary branches per plant + Test weight	2.312	98.824
24	Number of umbels per plant + Number of umbellates per umbel	2.416	103.304
25	Number of umbels per plant + Test weight	2.386	102.314
26	Number of umbellates per umbel + Test weight	2.234	95.501
27	Days to first flowering + Days to 50 percent flowering + Days to maturity	1.463	62.534
28	Days to first flowering + Days to 50 percent flowering + Plant height at maturity	2.169	92.733
29	Days to first flowering + Days to 50 percent flowering + Number of primary branches per plant	2.29	97.921
30	Days to first flowering + Days to 50 percent flowering + Number of umbels per plant	2.374	101.513
31	Days to first flowering + Days to 50 percent flowering + Number of umbellates per umbel	1.751	74.848

<b>32</b>	Days to first flowering + Days to 50 percent flowering + Test weight	2.24	95.781
<b>33</b>	Plant height at maturity + Number of primary branches per plant + Number of umbels per plant	2.391	102.225
<b>34</b>	Plant height at maturity + Number of primary branches per plant + Number of umbellates per umbel	2.34	100.058
<b>35</b>	Plant height at maturity + Number of primary branches per plant + Test weight	2.363	101.007
<b>36</b>	Plant height at maturity + Number of umbels per plant + Number of umbellates per umbel	2.417	103.32
<b>37</b>	Plant height at maturity + Number of umbellates per umbel + Test weight	2.34	100.02
<b>38</b>	Number of primary branches per plant + Number of umbels per plant + Number of umbellates per umbel	2.405	102.81
<b>39</b>	Number of primary branches per plant + Number of umbellates per umbel + Test weight	2.323	99.323
<b>40</b>	Number of umbels per plant + Number of umbellates per umbel + Test weight	2.444	104.504
<b>41</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity	2.175	92.995
<b>42</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of primary branches per plant	2.3	98.33
<b>43</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of umbels per plant	2.374	101.513
<b>44</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of umbellates per umbel	1.754	74.998
<b>45</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Test weight	2.243	95.893
<b>46</b>	Plant height at maturity + Number of primary branches per plant + Number of umbels per plant + Number of umbellates per umbel	2.417	103.347
<b>47</b>	Plant height at maturity + Number of primary branches per plant + Number of umbels per plant + Test weight	2.418	103.353
<b>48</b>	Number of primary branches per plant + Number of umbels per plant + Number of umbellates per umbel + Test weight	2.449	104.68
<b>49</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of primary branches per plant	2.339	99.998
<b>50</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of umbels per plant	2.349	100.406
<b>51</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of umbellates per umbel	2.392	102.264
<b>52</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Test weight	2.363	101.029
<b>53</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of primary branches per plant + Number of umbels per plant	2.384	101.922

<b>54</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of primary branches per plant + Number of umbellates per umbel	2.381	101.776
<b>55</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of primary branches per plant + Test weight	2.394	102.341
<b>56</b>	Plant height at maturity + Number of primary branches per plant + Number of umbels per plant + Number of umbellates per umbel + Test weight	2.450	104.7
<b>55</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of primary branches per plant + Number of umbels per plant	2.394	102.341
<b>58</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of primary branches per plant + Number of umbellates per umbel	2.381	101.776
<b>59</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of primary branches per plant + Test weight	2.384	101.922
<b>60</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of primary branches per plant + Number of umbels per plant + Number of umbellates per umbel	2.408	103.5
<b>61</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Number of primary branches per plant + Number of umbels per plant + Test weight	2.413	103.583
<b>62</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of primary branches per plant + Number of umbels per plant + Number of umbellates per umbel	2.421	103.612
<b>63</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of primary branches per plant + Number of umbels per plant + Test weight	2.423	103.652
<b>64</b>	Days to first flowering + Days to 50 percent flowering + Days to maturity + Plant height at maturity + Number of primary branches per plant + Number of umbels per plant + Number of umbellates per umbel + Test weight	2.454	104.923

Further, addition of number of primary branches per plant to above three character index resulted in increased relative efficiency to the extent of 4.68 per cent over straight selection for seed yield.

The combination of five characters *viz.*, plant height at maturity, number of primary branches per plant, number of umbels per plant, number of umbellates per umbel and test weight indicated the expected genetic advance of 2.450 with relative efficiency 104.7 per cent. The index consisting of six and seven character combinations showed lower relative

efficiency than the relative efficiency observed from characters in combination of three. Finally the selection index comprising of all the characters under study, exhibited maximum efficiency of 104.923 per cent *i.e.* 4.923 per cent increased efficiency over straight selection for seed yield alone.

The results of similar nature were also observed by Monpara *et al.*, (2010) in okra, Rajamani *et al.*, (2016) in pigeon pea and Kalagare *et al.*, (2021) in pearl millet.

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