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Effect of foliar applications with auxin (Indole-3-Acetic Acid (IAA)) and planting dates on yield quality and quantity of in three cultivars of cotton fibers

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Key words: Auxin (IAA), Cotton, planting dates, quality and quantity of fibers, varieties.

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Abstract

In order to assess the effects of hormone indole acetic acid and sowing dates on yield and quality of cotton cultivars in a field study in Alborz Province and the city Eshtehard, R. Tawhid field during 2012 was performed. This test is a split-split-plot in a randomized complete block design with three replications was studied. Hormonal factor at 2 levels (1 level recommended for GH (500 mg) and 2 control without hormones) and the factor of five, including Varamin (control) V2= Q30, V3= E91, is requirements. Planting dates were 11 May, 21, and 31, respectively Analysis of variance showed that planting date and cultivar solution and foliar applications with auxin in some quantitative and qualitative traits, there are significant differences (Table 2). Planting date on fiber fineness ($p < 0/05$), of Kiel ($p < 0/05$) and early ($p \leq 0/05$) and the boll carpel weight ($p \leq 0/05$) had a significant effect. The figures are also the ($p \leq 0/01$), and percent stretch ($p < 0/05$) and the percentage of lint% ($p \leq 0/01$) and fiber weight ($p \leq 0/01$). And cotton-seed weight ($p \leq 0/01$) had a significant effect And auxin effects on boll number ($p \leq 0/01$) and the number of opened boll ($p \leq 0/01$) was significant. The hormone auxin interactions and figures on the number of opened boll significant ($p < 0/05$) and also the interactions between cultivars, the plant hormone auxin was significant ($p \leq 0/01$).

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Introduction

Upland cotton, *Gossypium hirsutum* L, is the world's leading fiber producing crops and grown in more than 80 countries resulting in an annual production of 20 million tones (Dutt *et al.* 2004). Cotton as the one productive of economic growth that causes provides income to millions of farmers in industrialized and developing countries around the world (khodabandeh, 1995). Iranian Achaemenid period and planting a variety of indigenous cotton that has been common among Asian cotton and textile industry has been in common (mansourbakht, 2010). Prime Minister of at Mirza Taghi Khan Amir Kabir (one the men history of Iran) early efforts to develop high-quality cotton and cotton production occurred in Iran (khodabandeh, 1995). The area under cotton cultivation in Iran in 2010 was about 142 thousand hectares, of which 95% are grown on irrigated land and dry land was 5% (Ghavami & Habibi, 2012). Cotton is an important economic crop in the iran. Increasing crop yield potential has been a major goal in cotton research for decades. More recently in the Iran, there has been urgency among cotton researchers to improve fiber quality. Since cotton is an indeterminate plant, selection of suitable varieties and the use of plant growth regulators in cotton management is an important factor (Craig and Gwathmey, 2003). One possible area of improving fiber quality could be supplemental use of hormone application Phytohormones have been found to play an important role in plants development (May, 1999). Plant growth regulators have plentiful applications in agriculture such as delaying or accelerating maturity, stimulation, flowering, abscission, controlling weeds and so on (Harkess & Lyons, 1994). Auxins are a group of herbal hormones which IAA is the most important of them (Glick, 1995). So, due to factors affecting plant growth, which seems to improve the management of vegetative and reproductive growth period can also adjust the appropriate quantitative and qualitative performance achieved by the end of economic benefits, will accrue to farmers (Behnia *et al.*, 2006). Factors such as the rapid maturation of the major causes of premature boll of cotton that are greatly affected by cultivar, climatic conditions, farm management are located (Meredith *et al.*, 1996).

Materials and methods

Type of design and treatments

The experiment was a split-split-plot randomized complete block design with three replications to influence foliar auxin (indole- 3 acetic acid) and Planting dates in quantitative and qualitative performance of five cultivars of cotton fibers Unity Farm, located in Alborz Province, Eshtehard city was carried out. (Lat. 35°42´ N., Long. 50°16´ E. Alt. 1218 m from sea level) with mean long-term rainfall of 280 mm, Average temperature of 16.6°C The region-based segmentation climate is semi-arid climate coupon Planting dates include May 11, May 21 and May 31 will apply.

Plant material collection

Planting dates as main plots and cultivars as subplots and hormonal treatments were considered as sub-sub plots. Foliar applications hormone indole -3 - acetic acid, with manufacturer's recommended by concentration (500 ppm) occurred early flowering. The control treatment consisted of NAOH and water. All working concentrations and the control solution had a pH value of 9 (Clement. 2010).

Space between plots and replications

Dose of NPK fertilizers after soil degradation and soil and water laboratory was based on the technical instructions. The number and size of experimental plots, 27 plots with an area of 40 square meters, which is 8 lines 55 cm apart and plant spacing to achieve the recommended density in the region (8 to 12 plants per square meter) was the layout. To avoid mixing plots, row spacing plots were considered. Do foliar concentrations were predicted. Practices, including watering, weeding, pests and diseases in the field test was carried out uniformly. Measurement of characteristics Notes of collected plants after removing a meter from edge of the middle of the beginning and end of each plot was done and it was done on the study of qualitative and quantitative traits. In assessing fiber quality in lint%, effective fiber length, uniformity, fineness, strength, and

stretch percentage, was calculated. These characters, Vice Fiber Technology Division Research Institute Varamin cotton using HVI were measured. Plant population of cotton plants (*Gossypium hirsutum* L.) and sampling was performed to measure to 18 characters.

Data analysis

Analysis of variance (ANOVA) and means comparison was carried out by Duncan's multiple range test (LSR) with statistical software MSTATC and SPSS.

Results and discussion

Analysis of variance showed that planting date and cultivar solution and foliar applications with auxin in some quantitative and qualitative traits, there are significant differences (Table 2). Planting date on fiber fineness ($p < 0/05$), of Kiel ($p < 0/05$) and early ($p \leq 0/05$) and the boll carpel weight ($p \leq 0/05$) had a significant effect. The figures are also the ($p \leq 0/01$), and percent stretch ($p < 0/05$) and the percentage of lint% ($p \leq 0/01$) and fiber weight ($p \leq 0/01$), and cotton-seed weight ($p \leq 0/01$) had a significant effect and auxin effects on boll number ($p \leq 0/01$) and the number of opened boll ($p \leq 0/01$) was significant. The hormone auxin interactions and figures on the number of opened boll significant ($p < 0/05$) and also the interactions between cultivars, the plant hormone auxin significant ($p \leq 0/01$) was.

Table 1. Chemical and physical characteristics of the soil.

Clay	Silt	Sand	N (total) (%)	P ($mg.kg^{-1}$)	K ($mg.kg^{-1}$)	EC (ds/m)	pH	(TNV)	Organic matter
10	12	78	173.2	3.95	0.04	7.89	8.1	8.10	0. 38

Table 2. Analysis of variance for plant characteristics in cotton cultivar.

S.O.V	df	Yield	UHML	UL	MI	g.tex	EL	Lint%	lint	Seed Weight
Rep	2	257.650	3.136	2.454	0.047	1.356	0.004	0.000	88.243	169.518
Sowing date (A)	2	223.445	12.826	4.052	*0.436	9.463	0.507	*0.005	140.587	100.108
Error (Ea)	4	244.265	7.702	2.862	0.071	4.199	0.128	0.001	80.932	165.437
Main Plot	8	242.406	7.841	3.057	0.155	4.804	0.0798	0.001	97.673	150.125
Cultivar(B)	2	*625.101	8.278	7.607	0.062	3.523	*0.307	*0.005	*251.817	*387.999
A*B	4	274.399	3.715	5.792	0.036	1.809	0.044	0.001	93.220	184.103
Error (Eb)	12	104.187	2.664	4.532	0.143	3.209	0.052	0.001	40.789	66.323
Sub Plot	18	199.891	3.521	5.153	0.110	2.933	0.022	0.001	75.887	128.238
Auxin (c)	1	2.420	1.833	13.450	0.098	4.250	0.098	0.000	2.002	0.690
A*C	2	14.274	1.210	2.689	0.059	0.913	0.003	0.000	4.690	9.875
B*C	2	74.672	0.309	3.759	0.008	3.544	0.064	0.001	45.241	32.935
A*B*C	4	105.796	5.179	3.625	0.007	1.961	0.012	0.000	43.123	63.738
Error(c)	18	99.213	3.396	10.820	0.063	2.412	0.057	0.001	42.451	59.421
Sub Sub plot	27	88.493	3.211	8.726	0.051	2.386	0.008	0.0005	38.462	52.253
C.V (%)	-	17.21	6.49	3.98	4.84	5.26	3.51	6.76	18.11	17.02

*Correlation is significant at the 0.05 level

**Correlation is significant at the 0.01 level.

Yield

Analysis of variance showed that cotton cultivars affect performance significantly ($p < 0/05$), but in other cases the effect was not significant (Table 2). In comparison, the figure Q30 highest yield obtained cultivar Varamin lowest performance demonstrated between figures Q30 and E-90 functions similar was observed (Fig.1) so that the number of Q30 with the 4183/944 yield figures E-90 and Varamin Order 3438/389 and 2862/278 kg (Table 2). The results showed that delayed planting and sowing early and sprayed with a solution of auxin and their interaction

had no effect on cotton yield

Fiber fineness MI

According to the analysis of variance of fiber fineness significantly influenced by sowing dates differences (p <0/05) showed (Fig. 2). But the effect of the different varieties and sprayed with a solution hormone auxin and their interaction is not significant (Table 2). In a similar study, fiber fineness on early planting in Louisiana dropped (Aguillard *et al.*, 1980).

Table 3. Analysis of variance for plant characteristics in cotton cultivar.

S.O.V	df	No. of boll	Boll Weight	No. of boll open	No. of symptoms	No. of bods	Height	Distance to the first sympods	Earliness	carpel Weight
Rep	2	0.560	0.829	0.653	0.017	10.130	45.722	1.524	0.008	0.121
Sowing date (A)	2	0.687	0.438	2.627	0.894	8.019	23.431	21.587	*0.152	*0.081
Error (Ea)	4	1.961	0.244	1.229	0.312	24.185	170.007	21.507	0.015	0.007
Main Plot	8	1.292	0.438	1.434	0.383	16.62	102.291	16.531	0.047	0.0541
Cultivar(B)	2	3.376	0.016	2.797	0.089	4.019	163.292	10.316	0.001	0.127
A*B	4	2.335	0.810	1.360	0.484	4.741	96.139	1.694	0.016	0.111
Error (Eb)	12	1.396	0.752	1.163	0.354	4.389	88.711	7.322	0.021	0.073
Sub Plot	18	1.824	0.683	1.388	0.353	4.42	98.648	6.403	0.017	0.087
Auxin (c)	1	*4.737	0.705	*2.667	0.078	2.667	30.375	3.251	0.009	0.228
A*C	2	2.079	0.376	1.049	0.457	12.167	67.597	1.050	0.009	0.176
B*C	2	2.255	0.003	*2.319	0.480	3.500	*221.792	19.154	0.013	0.047
A*B*C	4	0.484	0.513	0.615	0.132	1.667	22.639	2.630	0.015	0.117
Error(c)	18	0.847	0.529	0.589	0.262	4.463	61.787	9.075	0.007	0.066
Sub Sub plot	27	1.132	0.482	0.831	0.266	4.481	67.106	8.056	0.009	0.086
C.V (%)	-	22.72	13.18	21.37	17.72	14.15	12.94	27.35	10.89	18.30

*Correlation is significant at the 0.05 level.

**Correlation is significant at the 0.01 level.

Percent stretch EL

Analysis of variance showed a significant difference in the percentage figures are affected stretching EL (p <0/05) (Fig. 4-1). Q30 cultivar had the highest percent, but the effect of sowing date and soluble are sprayed with hormones auxin and their interactions were not significant (Table 2).

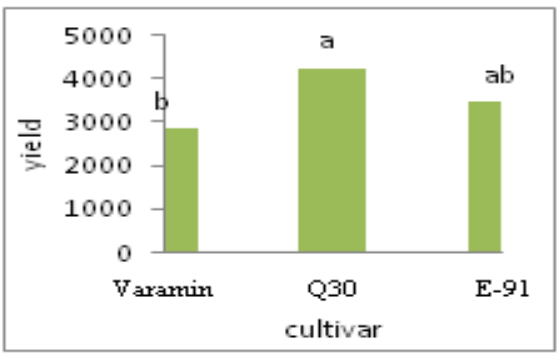

Fig. 1. Comparison of the average seed cotton yield.

Lint % percentage

Analysis of variance showed a significant difference in the percentage of int% percentage ¬ sowing date significantly affected (p <0/05) and the first planting date showed the highest rate (Figure 3-6). And figures (Q30 and E-90 Effect of meaning (p ≤ 0/01) compared to the number of E-90 percent lint % percentage showed. (See Figure 3-7). However, the effect of soluble sprayed with hormones auxin and their interaction means there was not (table 2).

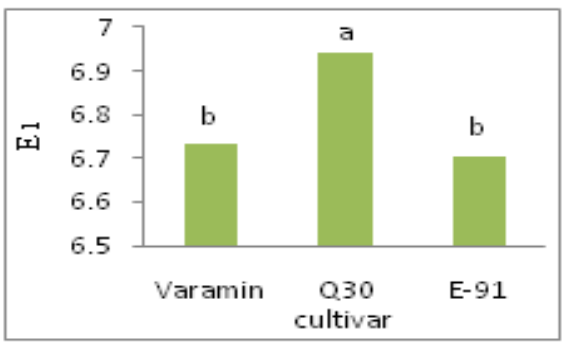

Fig. 2. Comparison of sowing date on fiber fineness.

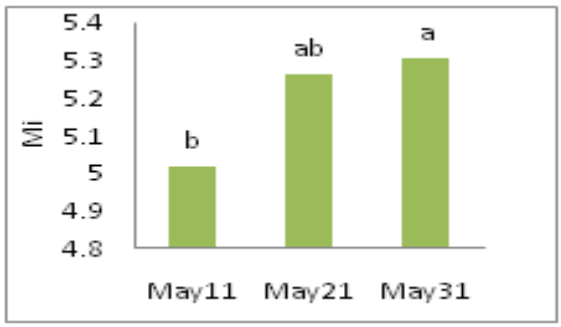

Fig. 3. Comparison of data on fiber strength.

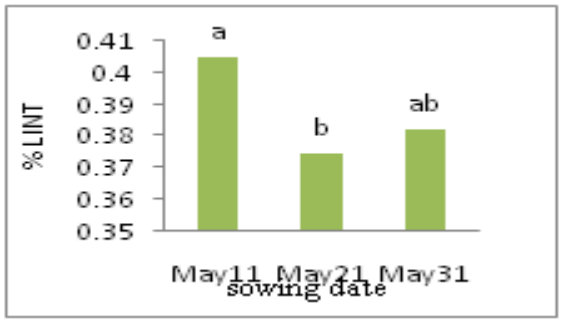

Fig. 4.1 Comparison of the effects of planting date on cotton % lint.

Weight fiber

Analysis of variance showed that the meaning figures are influenced by fiber weight (p <0/05) (Fig. 5). Q30 cultivar had the highest percent, but the effect of sowing date and soluble are sprayed with hormones auxin and their interactions were not significant (Table2).

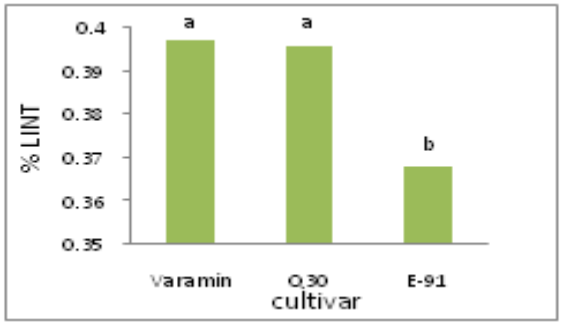

Fig. 4.2 Comparison of the figures on the percentage cotton % lint.

Seed weight (seed cotton)

Analysis of variance showed a significant difference in seed weight affect in figures (p <0/05) (Fig. 6). Q30 cultivar had the highest percent, but the effect of sowing date and soluble are sprayed with hormones auxin and their interactions were not significant (Table 2). Results Table Analysis of variance showed that the effect of auxin on the number of open boll significant effect (p <0/05) and the interaction between variety and number of boll opening auxin effects significantly (p <0/05) and on sowing and varieties on the number of open cotton boll effect was not significant (table 2).

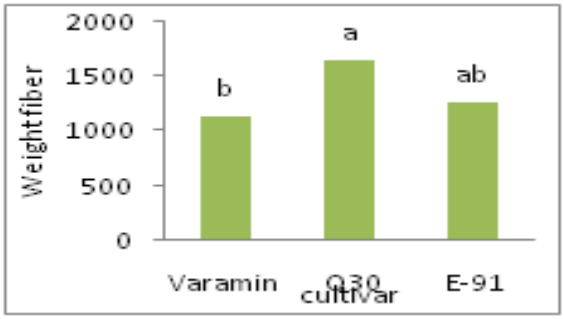

Fig. 5. Comparison of data on fiber weight.

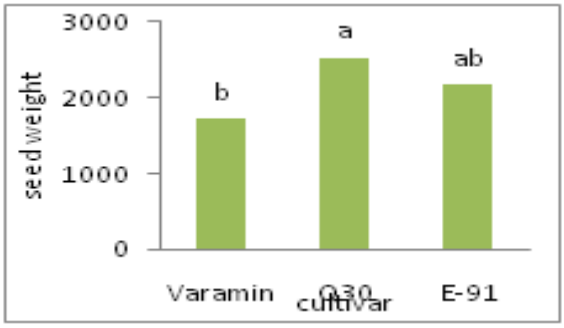

Fig. 6. Comparison of data on seed weight (seed cotton).

Boll number

Results Table Analysis of variance showed that the effect of auxin on the head of a significant effect (p <0/05) and sowing date and cultivars and their interactions on the number of boll effect was not significant (Table 2).

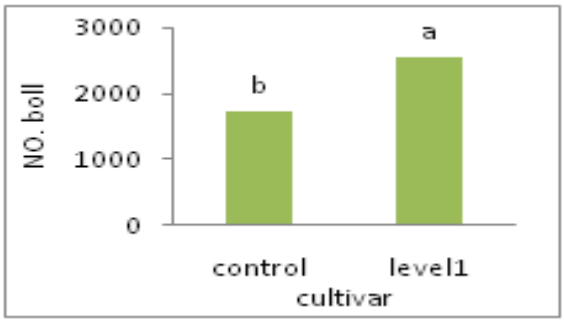

Fig. 7. Comparison of the effects of auxin on bud.

Number of boll opening

Results Table Analysis of variance showed that the effect of auxin on the number of open boll significant effect (p <0/05) and the interaction between variety and number of boll opening auxin effects significantly (p <0/05) and on sowing and varieties on the number of open cotton boll effect was not significant (table 3).

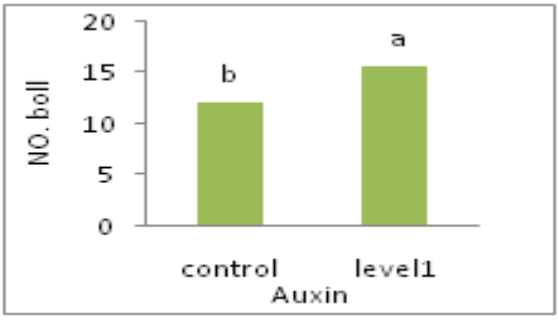

Fig. 8.1 Comparison of the effects of auxin on boll opening.

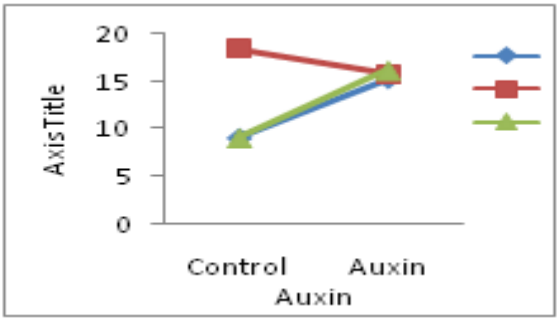

Fig. 8.2 Comparison and auxin interaction figures on the number of open boll.

Height

Results Table Analysis of variance showed a significant interaction between variety and auxin effects on cotton plant height (p <0/05) and sowing dates and varieties on Cultivar Cotton effect was not significant (Table 3).

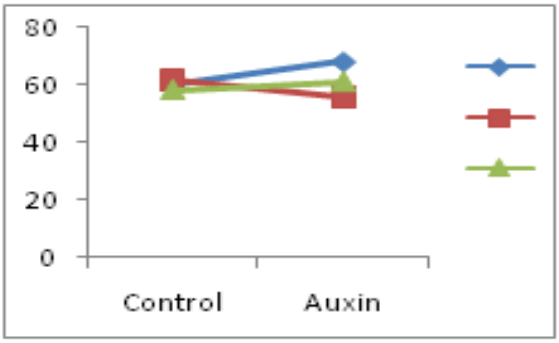

Fig. 9. Comparison of figures and auxin interaction on cotton height.

Earliness

Results Table Analysis of variance showed that planting date significant relationship (p <0/05) of early (Figure 10), and various cultivars and their interactions on total earliness and Vaccine Cotton effect was not significant (Table 3).

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