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Effect of gibberllic acid (GA3) foliar on some physiological traits and mount of pigments in *brassica napus* L.

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Abstract

In order to study the effects of Gibberellic acid (GA3) foliar on *brassica napus* L. the experiment was carried out in Research Laboratory and research field of Islamic Azad University of shahr-e-Qods in randomized completely design and randomized completely block design with 3 replications and 3 treatments such as: 1: control (water), 2: (GA3, 0.0001 molar), and 3: (GA3, 0.001 molar) which seeds were foliar at 45 minutes in GA3 these solutions. The result showed that there was significant difference at 5% level among treatments such as seedling length, ratio of root length to shoot length, chlorophyll (b) and fresh weight at 1% level and enhance of total chlorophyll. But among treatments there was no significant difference in germination percentage, root length, chlorophyll (a), dry weight and seed vigor. Also the resumed result of field section showed that there are not significant differences among treatment such as final emergence percentage, shoot length, MDG and DGS, but with considering the comparison of means table (table 4) the use of Gibberellic acid caused to enhance of shoot length.

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Introduction

Brassica napus L. is one of the most important oil seed plants. Oil of canola have unsaturated fatty acids and have no cholesterol and it can be one of the reasons for high quality nutritions. Canola seed have 25-50% oil, 18-24% protein and 12-20% pod. The use of priming method is one of the proper methods for increasing seed quality in unsuitable environments (Basra *et al.*, 2004), which increases the seed germination and emergence of seedling (Akeson, Henson. 1980). Seed can be treated with different physical and chemical components such as gibberellic acid, Cytokinin, Hydrochloric acid, chloride sodium, potassium nitrate, and sulfuric acid seed cracking (sultan, kochaki, 2007). It is well known that hydrolyzed enzymes are produced at germination time that can autolysis the fatty acid and carbohydrate storage and protein tissues(Moore *et al.*, 2011).

It is now generally accepted that gibberllins have provocative role in germination and breaking of seed dormancy (Fathi, Esmailpour, 2000). Developing seeds are sources of gibberellic acid and are highly active in the biosynthesis of this component (Moore *et al.*, 2011). Gibberllic acid is a plant growth regulator that has great role on growth of nodules (Hooley, 1994; Ross, Murfet and Reid. 1997; Sawin and Olszewski Neil, 1996). Gibberllic acids are produced in seed at germination time (Bewley, Black. 1982) and caused hydrolyze of storage components for seedling development (Kepczynski, Groot. 1989). Researchers reported that foliar of gibberllic acid increases the vigor of rice seeds, corn, pea seeds and that causes rapid establishment, early flowering and high yield agriculture (Rashid *et al.*, 2006). Haberland, (1890) has reported that aleurone layer in *Secale cereal* L. can produce substances that can analyze starch of seeds. Brown and Escombe, (1998) had similar results in *Hordeum vulgare* L. (Moore *et al.*, 2011). Chlorophyll content in plants is one of important factors to retain biosynthesis capacity (Jiang, Huang. 2001).

Use of Chlorophyll fluorescence is a suitable method for discussions about photosynthesis and situation of physiological traits for plant (Sthapit, Witco be, Wilson, 1995; Rizza *et al.*, 2001). Also in trial that was performed by Shobbar *et al.*, (2007) on cytoplasm Male Sterility line of rice, the gibberellic acid role on Peduncle growth augment by its significant effect. Use of external gibberellic acid in plants species is making that plants has rather early growth and also has shorter growth period that this affair results economizing in expenditures especially in greenhouse plants and also better weed control(Paleg. 1965) that these consideration coincide with trial that by Jones and Hanks, (2001) performed, they by soak of bulb been chilling tulips in different gibberllic acid consistency concluded that treatment with gibberllic acid can decrease greenhouse period 7-11 days than bulbs untreated.

In addition, in other trial that performed (Hasanpoorasil, Roien and Rabie. 2010) in daffodil German type cultivate gibberllic acid treatment effect caused boughs growth and (quality of leaf and stem) and shorter growing period.

The Effect of Gibberllic Acid (GA3) on some physiological features in transgenic tobacco plants showed that with enhancing gibberllic acid density, noticeable increase in both Transgenic plants and Non-transgenic plants can occure(Abbaspour and Ehsanpour. 2011).

Herbaceous hormones like gibberllic acid perform important role in germination and growth (Jamil and Rha. 2007). The main objective of this study was to evaluate the effects of Gibberellic acid (GA3) foliar on seed germination, amount of pigments and early growth of *Brassica napus* L.

Materials and methods

In order to study the effects of Gibberellic acid (GA3) foliar on *Brassica napus* L. experimental as a randomized complete design and randomized completely block design with 3 replication and 3 treatment as a treatment1: control (general water), treatment 2: (GA3, 0.0001 molar), treatment and 3:

(GA3, 0.001 molar) in the research laboratory and research field of Islamic Azad University shahr-e-Qods Branch was performed.

Experiment method

At the beginning seeds soaked in said treatment solution for duration of 45 minute and therefore in each replication put 100 number seed between two layers of leach paper and next irrigated with general water for all treatment for duration of 8 days after germination. Therefore all number seeds that germinated (produced seedlings) counted and recorded and data appointment as germination percentage. Therefore each replication that selected 10 normal seedlings and their shoot length, root length and ratio of root length to shoot length and fresh weight measured and then seedlings inserted in oven for 48 hours at 75 centigrade and at the end measured seedling dry weight.

Seed vigor index

Seed vigor index calculation by this formula:

seedling dry weight × germination percentage

Also amount of samples chlorophyll (a), chlorophyll (b), chlorophyll (t), had been measured.

In addation, in field section the mounts of final emergence percentage and shoot length are measured too.

Average of daily germination calculation by below formula:

$$MDG = \frac{FGP}{d}$$

That this formula FGP: germination percentage, d: numbers of days to max of germination (period of experiment performance).

Daily germination speed is reverse of Daily germination average and calculation by below formula:

$$DGS = \frac{1}{MDG}$$

Statistical Analysis

In final step the information which is analyzed by static software's SPSS16 and SAS and instance scrutiny and comparison with Duncan test.

Results and discussion

The results resumed of trial showed that among treatments of shoot length there was significant different at 5% level (table 1). That Pursuant to comparison of means (table 2) highest shoot length was related to treatment 2(0.0001 m). That its cause may be known in more stimulation of cell division and also cell enlargement. In one trial that is performed in bean seedling (phaseolus) it was found that both parameters, cell division and cell enlargement, are stimulated by external GA3; but it is assumed that has been highest effect on cell enlargement (Moore *et al.*, 2011). In general stem enlargement in all plants that is treated by external GA3 dependency to hormone effects on cell division and cell enlargement that effect one is more than effect two(Moore *et al.*, 2011).

Table 1. Analysis of variance for effect of foliar Gibberellic Acid (GA3) on some physiological features in brassica napus.

Mean square (MS)					
Root/shoot	Root length	Shoot length	Germination percentage (%)	df	S.O.V
0/59 *	0.662 ns	1/658*	4.000 ns	2	Treatment
0.007	0.15	0.318	3.000	6	Error

*Significant at 5% level , ns, non Significant.

Although judging from results of germination percentage and root length did not observe significant difference among treatment about Proportion of root length to shoot length, there were some essential points at 5% level that highest said adjective was related to treatment1,control(general water)(table 1.2) that showed gibberellic acid was not effective on root growth. Be meant to that gibberllic

acid is not necessary for roots growth. Do not turn out that gibberllic acid is stimulating roots growth or is inhibited or whereas gibberllic acid is effective on cell division or cell enlargement in root (Moore *et al.*, 2011).

In addition judging from resumed results of the field section there was not significant difference among treatment such as final emergence percentage, shoot length, MDG and DGS (table 3), but with attention to comparison of means table (table 4) the use of Gibberellic acid is caused the enhancement of shoot length that highest was related to treatment 2(0.0001 molar) and lease was related to treatment control (general water). Also the comparison of means (table 4) showed the enhancement of MDG and Daily germination speed (DGS) but these enhancements were small.

Table 2. Comparison of mean effect of foliar Gibberellic Acid (GA3) on some physiological features in brassica napus.

Root/shoot	Root length	Shoot length	Germination percentage (%)	Treatment Gibberellic acid (M)
0/36 A	A 1/18	3/1 B	99/33A	1 Control
0/206 AB	AB 0/913	4/5 A	99/33A	2 (0.0001M)
0/080 B	B 0/266	3/36 B	97/33A	3 (0.001M)

Mean followed by similar in each column are not significantly different.

Table 3. Analysis of variance for effect of foliar Gibberellic Acid (GA3) on some physiological features in brassica napus.

Mean square (MS)					
DGS	MDG	shoot length	Final emergence	df	Sources of variation (SOV)
0.00001067 ^{ns}	0.210 ^{ns}	0.00111 ^{ns}	2.33 ^{ns}	2	Replication
0.00002779 ^{ns}	0.418 ^{ns}	0.90111 ^{ns}	21.00 ^{ns}	2	GA
0.00000827	0.157	0.17444	22.83	4	Error
3.444	3.3084	12.488	5.04		CV (%)

ns, non Significant.

The studies that performed on use of Gibberellic acid and its effect on different species Cycas, Zamia floridana and Zamia furfuracea showed that pretreatment by Gibberellic acid causes decreased time of germination and increases germination percentage (De Silva and Tambiah, 1952),(Dehgan, B. 1983),(Dehgan and Perez, 2005).

Khan, (1971) has reported that Gibberellic acid is a necessary regulator for dormancy and germination in seeds presence and absence of this hormone in physiological active density is determinant of germination.

Table 4. Comparison of mean effect of foliar Gibberellic Acid (GA3) on some physiological features in brassica napus.

DGS	MDG	shoot length (cm)	Final emergence (%)	Treatments Gibberellic acid (M)
0.0816 a	12.2 a	2.93 b	93.6 a	control
0.0818 a	12.2 a	3.96 a	97.6 a	GA (0.0001 M)
0.0870 a	11.6 a	3.13 ab	92.6 a	GA (0.001 M)

Mean followed by similar in each column are not significantly different.

The Gibberellic acid stimulating seed germination that in fact speeds the destruction of united proteins. (Ahmed Frank and Dennis, 1994). The hormones of plant like Gibberellic acid have an important role in germination and growth of plants (Ritchie and Gilroy, 1998).

Table 5. Analysis of variance for effect of foliar Gibberellic Acid (GA3) on some physiological features in brassica napus.

Mean square (MS)				
SEEDVIGOR	Dry weight	Fresh weight	df	S.O.V
0/459 ns	0/00004 ns	0/004 **	2	Treatment
0/185	0/000016	0/00001	6	Error

**Significant at 1% level, ns, non Significant.

By seedling fresh weight amount among treatments we can observe significant differences at 1% level (table 5) and judging from comparison of means table (table 6) highest said adjective observed on treatment 3(0.001 molar) which caused fresh weight increase of 20%. Our results are in accordance of H.Emami *et al* (Emami, 2011), showed that gibberllic acid is effective on fresh weight in lily.

In addition there is no significant difference among dry weight and seed vigor index in our observations (table 5).

Table 6. Comparison of mean effect of foliar Gibberellic Acid (GA3) on some physiological features in brassica napus.

SEEDVIGOR	Dry weight	Fresh weight	Treatment Gibberellic acid (M)
1/7567 A	0/01767 A	0/1600 B	1 Control
1/2900 A	0/01333 A	0/1467 B	2 (0.0001M)
0/9800 A	0/01033 A	0/2133 A	3 (0.001M)

Mean followed by similar in each column are not significantly different.

Gibberllic acid causes the increase of cell division and increase of elastic properties of the cell wall (Majidian, N. *et al*., 2009). In one examination it is showed that use of gibberllic acid makes water suctions and increase of seedling growth in sugar beet in Walter stress (Rashid *et al*., 2006). Emongor and Tshwenyane, (2004); Mutui *et al*., (2001) reported that gibberellic acid increases cut flowers fresh weight by negation of cell water potential. Lockhart, (1957) volunteered early document about station of gibberllic acid biosynthesis with the use of potato seedling, he showed that used GA3 may replaced of shoot apex as a perfect in pea below stem station enlargement and the result is that has been produced natural gibberellic acid product in stem apex. At (1960) paleg in Australia and yomo in Japan as a separately showed that when we add gibberllic acid to section of endosperm *hordeum vulgare*L, Seeds start to amylase enzymes which can produce inclusive Alfa amylase and sugars abandon in stimulator growth (Jones, and Hanks, 1985). Briges at 1963 added several hydrolyze enzymes to these observations (protease, Phosphatase, Beta Glucanase) (Mor, S. 2003). In 1961, researcher used halfed seeds without embryo hordeum that may show the added gibberllic acid makes it increase Alfa amylase activity (Mor, S. 2003). Inter cellular biosynthesis dependent gibberllic acid submitted for protease, Alfa amylase and 1&3-β Glucanase and Ribonuclease and nearly 1&3, 4-β Glucanase, Acid phosphatase and Dnase (Brown, and T-H, 1986). Seed pre treatment before germination is said to let the seeds establish root, but not appears (Basra, Pannu and Afzal, 2003).

Also in this trial the amount of chlorophyll (a), chlorophyll (b), total chlorophyll Measured that by resumed Result of statically analyze of chlorophyll (b)in treatment observation there were some significant differences at 5% level(table 7).

The Judging from comparison of means table (table 8) highest of said adjective was related to treatment 3 (0.001m) and caused increase of 14/62% chlorophyll (b) than treatment control, but Judging from scrutiny via Duncan test apparented that effect of gibberellic acid treatment 3 (0.001m) caused increase of 29/18% chlorophyll (t) than treatment control (table 8).

Table 7. Analysis of variance for effect of foliar Gibberellic Acid (GA3) on amount of pigments in brassica napus.

Mean square (MS)				
Total Chl	Chl (b)	Chl (a)	df	S.O.V
0/133 ns	0/24 *	0/004 ns	2	Treatment
0/001	0/001	0/001	6	Error

*Significant at 5% level , ns, non Significant.

Chlorophylls are macro molecules that vulnerability in stress conditions and is the the most important light absorbent pigment in Chlorophylls Tilakoid membrane. In one trial that performed by majidian.m *et al.*, (2009), pre treatment of calla lily corms, white flower type,in which gibberllic acid causes t increase of leaf Chlorophyll amount and is significant in 1 percent.

In one examination it is showed that there are very high and essential correlation among chlorophyll a, chlorophyll b and chlorophyll (t) (Enferad *et al.*, 2004).

Table 8. Comparison of mean effect of foliar Gibberellic Acid (GA3) on amount of pigments in brassica napus.

Total Chl [mg/g (FW)]	Chl (b) [mg/g (FW)]	Chl (a) [mg/g (FW)]	Treatment Gibberellic acid (M)
0/5795 B	0/327833 B	0/251900 A	1 Control
0/398767 C	0/210333 C	0/189033 C	2 (0.0001M)
0/818267 A	0/383967 A	0/244033 B	3 (0.001M)

Mean followed by similar in each column are not significantly different.

The chlorophyll of standpoint absorbent and use of light energy in the photosynthesis have basic role. In addition, growth regulators of plant efficacy on biosynthesis and analyze of chlorophyll, are effective straightly on photosynthesis (Fahimi, 1953).

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