Analyzing the effects of gibberellic acid hormone doses in different growth periods on performance quality of horse bean in Hamidiye climate condition

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Abstract: This study aimed to analyze the effect of different doses of hormone gibberellic acid at growth different periods on qualitative and quantitative performance of ***Vicia faba L*** in farming year 2009-2010 by applying factorial experiments in form of randomized complete block design with two factors: the first factor, different concentration of the hormone gibberellic acid (d_0=0 d_1=5 d_2=50 d_3=250) and the second factor, three growth phases for use of hormone gibberellic acid (s_3= pod to seed, s_1= flowering to seed, s_0= vegetative before flowering) with three replications was performed on the farm of Hashemi in Hamidieh. The results of experimentation showed that the concentration 50 ppm of hormone gibberellic acid with yield of 2561 kg per hectare had been the best hormone concentration in terms of effects on quantitative traits (yield and yield components) the other hormone concentrations were in lower ranks in terms of performance, in terms of impact on protein content of seed between different concentrations of the hormone was not showed meaningful differences and three concentrations of 5 and 50 and 250 ppm were in one statistical level and had a higher protein content than control. Time of hormone use, the vegetative growth phase before flowering has been the best time of hormone use and has obtaned the highest performance, in terms of the protein content, this growth phase with 28.98% , allocated the maximum amount of protein to itself. In study of mutual effects, the concentrations of 5 and 50 and 250 ppm in the vegetative growth period before flowering had greatest protein content and highest seed yield obtained at concentration 50 ppm during vegetative growth before flowering.

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Key words: Vicia faba, Gibberellic acid, dose hormone, Vegetetive phase, Yield, Protein

1. Introduction

Legume forms the staple diet of many poor people in the world because high quality amounts in the grain of these products in combination with cereal can provide a valuable biological composition of food. In the Poor and populous countries of the world, such as India, with per capita consumption of 11.7 kilograms of legume, its share in the diet of people are more than other countries. In our country too, legume with per capita consumption of 8.4 kg, although the its consumption from global average 1.6 kilogram is lower, But also plays an important role in feeding low-income people, in addition to the higher content of protein and nutrients, grain consumption has for health many benefits. Vicia faba L, as one of the oldest cultivated plants for reasons such as enriched protein the other hand the desire to self-sufficiency in production and variation in the agricultural system and the rising cost of animal feed is growing day by day. Vicia faba L as an inexpensive plant in terms less need to fertilizer and easy control of pests and diseases is considered. To achieve maximum power of productivity, the external growth regulators, particularly gibberellic acid can be effective because these hormones can with effect on1- plant functional parameters 2- The effect on the fertile and non-fertile lateral branches and increasing total yield that can be had a major share in human and animal nutrition 3-influencing hormone gibberellic acid to prevent the abscission of flowers, thus increasing plant yield be followed.

In study of effective factors in seed glands germination of potato in the process of storage can be said that the seed potatoes after harvest, step by step their internal composition change, so that the amount of hormone gibberellic acid and cytokinin gradually increase and auxin and abscisic acid levels reduces and this will continue until budding glands (Paulista, 2004).

Mortazavi (1992) and Kalman (2001) stated that spraying gibberellic acid at concentrations between 100 and 1000 ppm for breaking dormancy of potato seed glands on the bushes during the growing period of plant and soaking glands in gibberellic acid soluble before planting is effective in breaking dormancy.

Hassan Abadi (1998), in the study of various methods of breaking dormancy of potato seed glands by using 16 and 24 ppm hormone gibberellic acid on potatoes glands digit Diamant, concluded that with increasing physiological age of glands and lapsing gland dormancy, levels of endogenous

gibberellic acid increases and the application of concentration of 16 ppm gibberellic acid have greater impact than concentration of 24 ppm on the number of buds and awakened gland.

Vali, Pourya (2001), for summer planting cultivars Concorde, Marfona, Diamant, Agroba and Cosima of potatoes in the Isfahan compared with treatment of breaking dormancy with spraying glands with gibberellic acid 100 mg per liter and treatment of non- breaking dormancy reported that treatment breaking dormancy causes a meaningful increase in yield of Concorde, Diamant and Marfona.

Farhoudi et al (2004), in the evaluation of breaking dormancy of Myrtus communize L seed concluded that treatments' experimentation, such as GA 250 and 500 ppm, chilling and mechanical scraping on germination percentage of this species have a meaningful effect.

Rahnavard et al (2004), in the study of germination of seed Araopa bella-donna L concluded that treatment with GA for 24 h has been caused a meaningful increase of seed germination of this species compared to other treatments.

Nadjafi et al (2006) showed that treatment with GA has meaningful effect on percentage and speed of seed germination of two medicinal types of Ferula gummosa. So that with increasing concentration of seed treatment Ferula gummosa with GA from 500 to 2500 ppm for 72 hours speed and percentage of seed germination this species showed meaningful increase. Also use of hormone gibberellic acid with concentration of 500 parts per million had the highest percentage of germination 45.5, and gibberellic acid with concentration 1500 parts per million, the highest the speed of germination with 71 percent in seed mass of species Teucrium.

Vali, Pouria. (2001), in study of the different methods of breaking dormancy of potato seed glands stated that the hormone gibberellic acid is one of the plant growth hormone that its use in high concentrations, intensifies leaf grow of some plants.

Charles et al. (1969), in study of the hormone gibberellic acid effect and CCC (2 Claire ethyl chloride tri-ammonium), on long-day plant Lemna gibba stated that hormone gibberellic acid in the concentrations higher than 1 mg per liter in the short days decreases fresh and dry leaf size and weight of long-day plants, but had the increasing effects in the production leaves and number of leaves of the plant.

Charles et al. (1969), in testing the effects of hormone gibberellic acid and CCC on flowering and growth of long-day plant Lemna gibba concluded that the spraying hormone gibberellic acid in a concentration of one mg per liter at the plant Lemna Giba increases number of leaves without paying attention to the getting smaller size and concentrations greater than 10 mg per liter of hormone gibberellic acid on plant Lemna gibba in short days causees getting smaller leaves and reduction in the number of leaves buds in plants. But application of gibberellic acid at a concentration of 10 mg and higher in long days increases the number of leaves.

Negatya and et al (2004), with the study of effect of levels and timing Gibberellic acid application on the growth components and yield of common ordinary by spraying hormone gibberellic acid in concentrations of 2.5, 5 and 7.5 mg per liter of hormone gibberellic acid in durations of 7 and 14 and 28 days after planting on the whole ordinary bean plant stated that hormone gibberellic acid increases leaf area index and reduction of solar radiation received in the ordinary beans.

Negatya and et al (2004), with the study of effect of levels and timing gibberellic acid application on the growth components and yield of common bean concluded that Leaf area index of plant after applying hormone gibberellic acid at different times of growth followed very different. Also best time to spray hormone gibberellic acid was determined 14 days after germination because the greatest increase in growth factors such as leaf area was determined at the same time so that in comparison grain yield at concentration of 7.5 plants performance that had received hormones in 14 days after flowering than those who had received hormone gibberellic the seventh day was about 3 times.

Charles et al. (1968), in the study of gibberellic acid on plant Lmnajyba said that the growth of the plant with increasing hormone gibberellic acid concentration decreases so that in the concentration of 0.-0.3 mg per liter had the greatest influence on the growth and concentration of 10 milligrams per liter, greatly reduced leaf size, leaf number and flowering.

Charles et al (1969) stated that plant growth Lmnajyba with the use of gibberellic acid raised but with increasing from appropriate concentration decreases, so that in the concentration of 0.1-0.3 milligrams per liter, had maximum effect on growth and in concentration of 10 milligrams per liter leaf size, leaf number and flowering was greatly reduced.

Climatic conditions of the expriment implementation place

This experiment during the agricultural year2009-10, in a farm Hashemi is located in the Seyyed Hossein village Hamidieh city was performed with following geographical specifications:

Table 1: Geographical Profile

Height above sea level	Longitude	Latitude
13 meters	Length of 48 degrees and 10 minutes	31 degrees 33 minutes

Place of experiment has a dry climate and semi-arid and minimum temperature 4° C and maximum temperature 51.8 ° C, the average annual temperature 23.9 ° C was reported in the station (Table 1).

Map cultivating the land

I	d_0s_0	d_0s_1	d_0s_2	d_1s_0	d_1s_1	d_3s_2	d_1s_2	d_2s_1	d_2s_2	d_3s_0	d_3s_1	d_3s_2
II	d_3s_2	d_3s_1	d_3s_0	d_2s_2	d_2s_1	d_2s_0	d_1s_2	d_1s_1	d_1s_0	d_0s_2	d_0s_1	d_0s_0
III	d_1s_2	d_2s_1	d_2s_2	d_3s_0	d_3s_1	d_3s_2	d_0s_0	d_0s_1	d_0s_2	d_1s_0	d_1s_1	d_2s_0

In the first factor, various gibberellic acid hormone concentrations (control, (without hormones) = d_0, 5 ppm = d_1, 50 ppm= d_2 and 250 ppm = d_3), and the second factor three phases of the growth ***Vicia faba L*** for spraying gibberellic hormone acid consists of: (s_0 =vegetative phase s_1 = flowering phase and s_2 = pod phase)

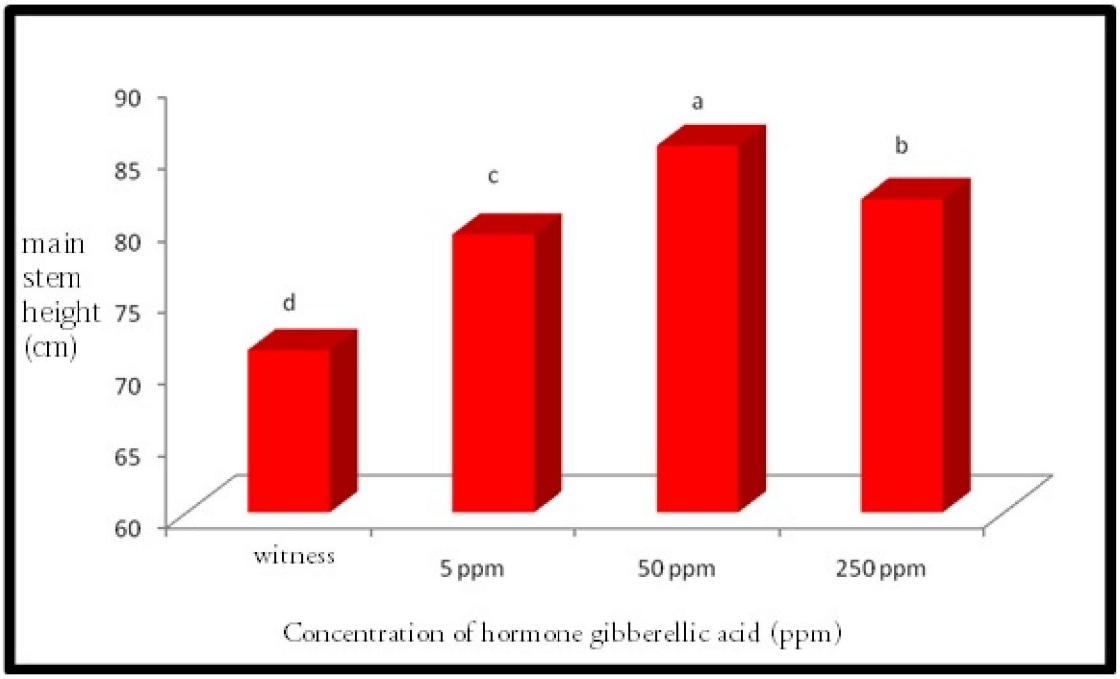

Diagram 1: The effect of different concentrations of the gibberellic acid hormone on stem height

Comparisons of the average hormone gibberellic acid concentration at different levels used for growth and qualitative attributes of under study plant

Percentage of nitrogen		Protein percentage		Leaf area index		Leaf dry weight		Stem dry weight	Dose hormone
4.55	a	28.43	a	1.70	b	726.2	c	1600 b	5 ppm
4.56	a	28.51	a	1.98	a	813	a	1724 a	50 ppm
4.50	a	28.53	a	1.76	b	750.2	b	1623 ab	250 Ppm
4.18	b	26.11	b	1.42	b	545.2	c	1490 c	witness
0.089		0.18		0.09		0.62		0.73	**LSD**

* Treatments that have Non-common letters in the Duncan's multiple range test in the 5% probability level have meaningful differences

Grain yield

Increase the number of pods for each plant and mass 100 seeds can be linked to better performance of parameters responsible for the overall increase grain yield. A high level of concentration of gibberellic acid has led to improve seed products, many Legumes including the beans. Increasing grain yield in some cereal is mainly due to increase of harves coefficient, in other words, the plant does not produce extra dry matter, but a large part of dry matter allocates to grain economic performance (Abdel Fattah et al., 1995).

In study of the effect of hormone gibberellic acid, at the level of one percentage on seed yield has been meaningful, time of using hormone gibberellic acid on seed yield has been meaningful at 5% level, mutual effects hormone in the growth phases has been meaningful in the 5% level.

In study of the effect of different concentrations of the hormone gibberellic acid on seed yield between the concentrations of 5 and 50 and 250 ppm a meaningful difference was observed but in total, hormone concentration of 50 ppm had maximum grain yield with 2561 kg per hectare in comparison with other hormone levels and was in Statistical level a. concentrations 5 and 250 ppm were lower Statistical levels than 50 ppm and control treatment without the use of hormones was in the lowest rate of seed production.

In the study of time effect of gibberellic acid hormone use on the grain yield, hormone use in the vegetative phaase before flowering had most seed yield with 2411 kg per hectare in comparison with other periods of growth and was in Statistical level a, other periods of growth were in the lower levels.

In the study of mutual effect of hormones and various growth period, best effect have been related to vegetative growth period before flowering with concentration of 50 ppm with 2889 kg per hectare in comparison with other mutual effect was in Statistical level a. Other mutual effect was in Statistical lower levels.

Above cases with the results Negatya and et al (2004), which stated probably the increase grain yield is due to the improvement flowering, the pod number and seed mass, also increase grain yield can be matched with influence of the hormone gibberellic acid on pod and mass of 100 grain, increase of carbon fixation that leads to increasing LAI.

Harvest index

Two useful terms that are used for describe the allocation of dry matter in the plant, are biological and economic performance. The term biological function is used for show the dry matter accumulation in plant systems and Economic performance or the agriculture performance used in the case of volume or weight of the organs that forms product and have economic value or agriculture. The proportion of biological function which forms the economic performance is called harvest coefficient or the performance coefficient displacement coefficient.

The maximum dry matter yield of the ***Vicia faba L*** stage is achieved in physiological maturity, after this stage, total dry matter yield of 10 to 20 percent reduced and these is due to the shade of the leaves and retransmission foods to roots and secretion of different material from the roots to the soil (Franklin, 1924).

GA hormone concentration on leaf area index has been meaningful at the 1% level, time spent hormone gibberellic acid on the leaf area index has been meaningful at 1% level, the mutual effect of various hormone concentration and growth are meaningful at level 1 percent.

In effect of gibberellic acid hormone concentration on Harvest index, between hormone concentration gibberellic acid 3, 5, 50 and 250 ppm there is no meaningful difference, but the concentration of 50 ppm with a 47.67 % in comparison with other concentrations had higher performance and then it was in a statistical level.

In effect survey of hormone gibberellic

acid on harvest index, between hormone concentration gibberellic acid 3, 5, 50 and 250 ppm there is no meaningful difference, but the concentration of 50 ppm with a 46.67 % in comparison with other concentrations had higher performance, and then it, is in statistical level.

In effect survey of growth period of hormone gibberellic acid use on Harvest index, the period of vegetative growth before flowering with 47.50 percent had the highest Harvest index; other periods of growth have been at lower levels.

In study of mutual effect between hormone concentration gibberellic acid with 50 ppm and time-consuming in period of vegetative growth before flowering were the highest statistical level And the period of vegetative before flowering with concentration of 5 ppm was in b statistical level, in the rest mutual effect did not show large and discernable difference.

Above cases with the results Abdolfattah (1955) and Negatya and et al. (2004) and Gardner et al. (1995), which stated the increase grain yield of legume can linked with influence the GA on pods and mass 100 seeds, the increase carbon fixation from gibberellic acid which leads to increase in leaf area index which leads to increase in plant dry matter, the increase growth and development lead to increase general dry mass and and buds as a result, the increase flowering, production pod and seed mass, which ultimately leads to the increase harvest coefficient in the match.

Grain protein percentage

Vicia faba L plant is an important source of protein, grain Legume protein more in the leaves and seeds were collected and more are Globulin type and amount of its amino acids cysteine, glutamic acid, arginine and ammoniacal nitrogen is low, nitrogen is depend on the percentage of protein, whatever protein be higher nitrogen will be higher (Koochaki and Banaian, 1994).

gibberellic acid hormone concentration on the protein percentage has been meaningful in the 1% level, Different growth periods of hormone use has not been meaningful on this trait in any level, mutual effect gibberellic acid hormone concentration and different periods of growth has been meaningful at 1%.

The effect survey of gibberellic acid hormone concentration on the protein percent concentrations 5, 50 and 250 ppm than control were in statistical level and have higher protein content.
The time effect survey of hormone use on the protein percent, in terms time, vegetative growth period before flowering with 28.98 % of the protein, had the highest percentage of protein and was in Statistical level a, the rest of growth period were placed in Statistical lower levels.

In survey of mutual effect gibberellic acid hormone concentration and growth period on protein, vegetative growth before flowering and the concentration of 5 and 50 and 250 ppm respectively, with amounts of 29.97 and 30 and 29.83 percent have obtained the highest Statistical level than others.

Perhaps because the hormone plays a role in the synthesis and attracting more smilats, the amount of nitrogen and following the protein content has been high.

Above cases matched with the results of Shafaatand Shabana (1980), who reported that gibberellin effective role in protein synthesis and cell enlargement and that the hormone is produced in the seeds of inside fruit and its spray increases the quantity and quality different fruit.

Also matched with results Hasbollah and colleagues (1984) reported that the hormone compounds and growth regulators by enhancing the production of RNA and RNA polymerase activity to increase the amount of protein.

The effect of different concentrations of the hormone gibberellic acid on seed filling rate

The general idea is that transfer of photosynthetic matter from source to destination this is that photosynthetic cells of source create sugar and the sugar through within cell gets to *Phloem* Exudatescells. Sugar loading act, the concentration of sugars within the cells will bring to a greater extent than what is in the cell walls. In destination are absorbed carbohydrates and actively is converted to cellular compounds such as starch or carbohydrates and in *Phloem* Exudates hydrostatic pressure have little effect, based on the assumption of a mass movement, any factor that increases photosynthesis, Hydrostatic pressure and the speed of transfer materials also increases, factors that control power of destination and grain filling rate can also control the distribution of photosynthetic, Hormones through the effect on enzymatic activity and flexibility can have a significant impact on transfer photosynthetic material and grain filling are, as regards the applying hormones such as cytokinin, ethylene and gibberellic acid on location of stem cut causes accumulation of photosynthetic material, according to the diagram and diagram can be said between different concentrations of the hormone gibberellic acid, concentration of 50 ppm was able to having greater positive effect on grain filling rate than other concentrations as a result, the grain fills more quickly and f have used rom timeframe for filling well (Negatya et al., 2004).

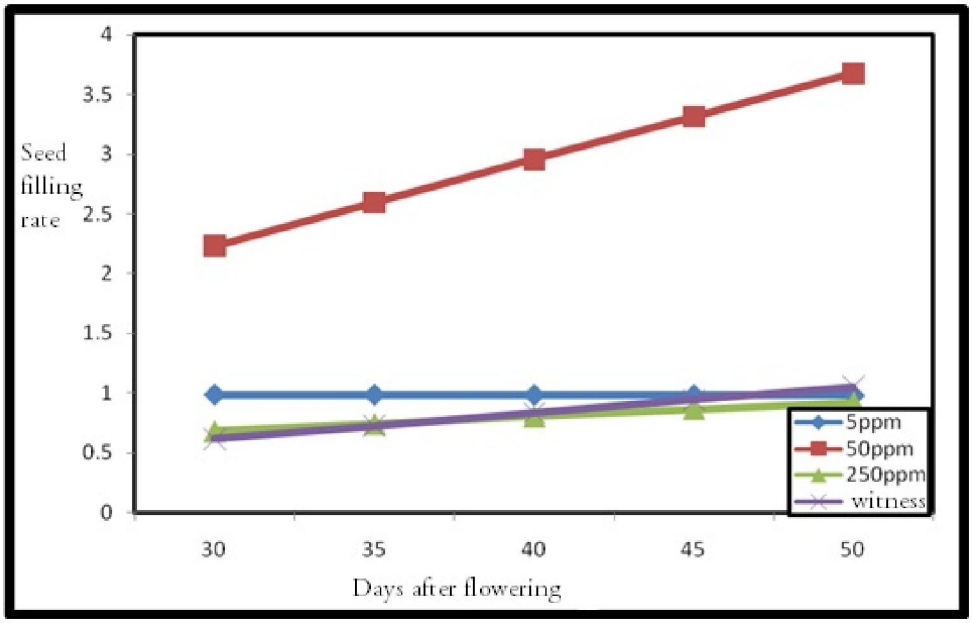

Diagram 2: one degree diagram gibberellic acid hormone concentration effect on grain filling rate

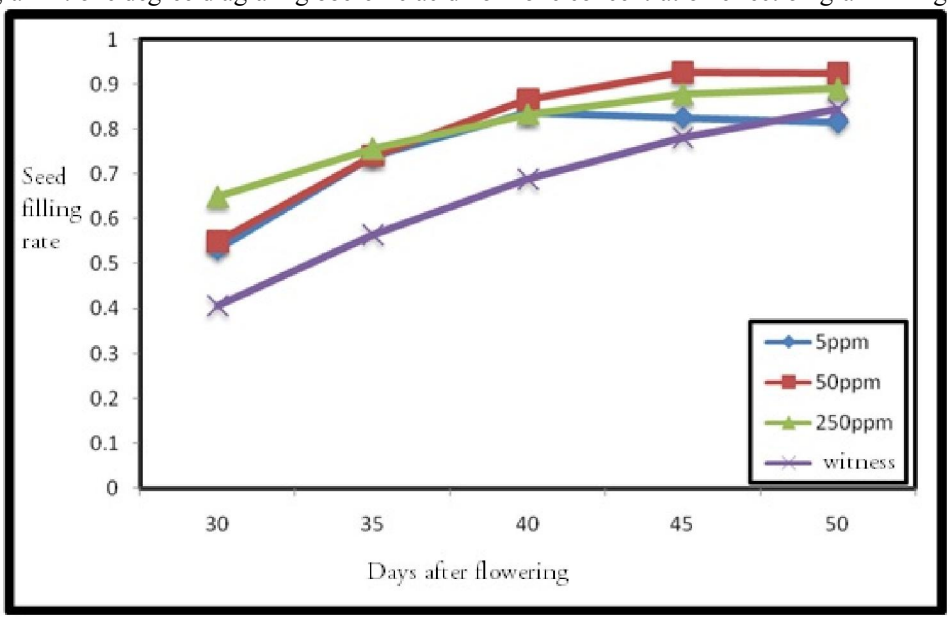

Diagram 3: degree two diagram of gibberellic acid hormone concentration effect on seed filling rate

The effect of different time's gibberellic acid hormone use on seed filling rate

During filling the grain If destination (seed) are not able to use additional production of sugar are continuously collecting in system and causes stop of own production by reducing photosynthesis, apparently photosynthesis rate diminishes with reduce of destination acceptance rate. For that leaf photosynthesis rate be maximum, the destination must have the ability using material produced by photosynthesis. In these conditions controls the allocation photosynthetic material by location capacity of the use or access material to the use location and the rate of photosynthesis consumption (Koochki, 1992). According to the Diagram and Diagram (4-46) can be stated that When plant receive hormones in the period of vegetative growth before flowering Due to the positive effects that gibberellic acid hormone have on the division and growth of different organs of plants and following photosynthetic material production also will increase, incremental process well have observed, because the plant is still young and receive most impact from environment, Other periods, such as flowering,

perhaps because the plant at this time has maximum production and growth and after this step, do not change too much, hormone effect not is high, hormone use in pod phase because plant growth has completed also many changes in grain filling rate is not observed, the above cases matched with the results of Shafaat and et al. (1980).

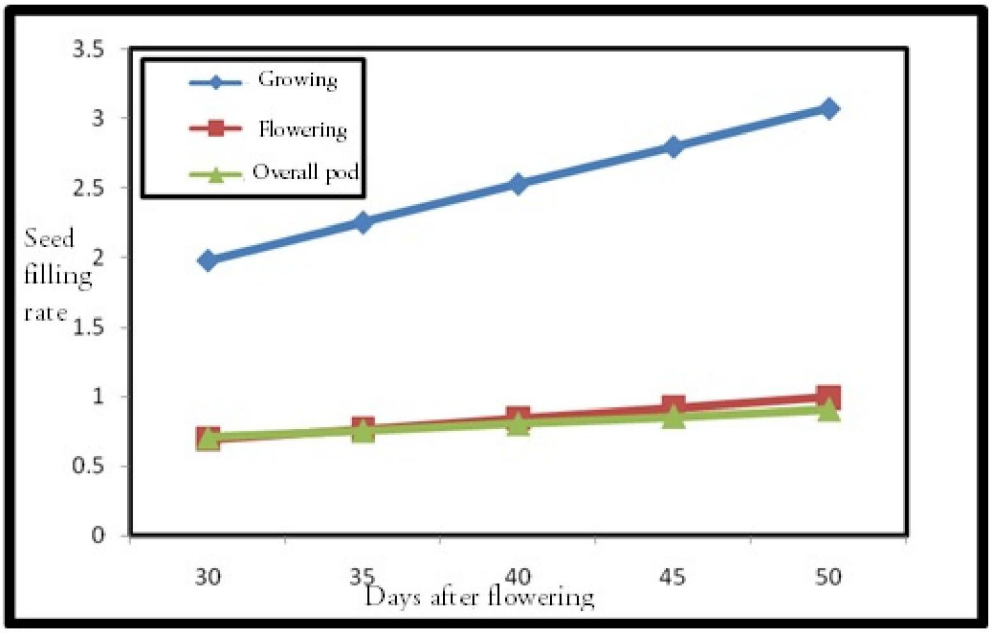

Diagram 4: First degree Diagram the effect of hormone use time gibberellic acid on seed filling rate

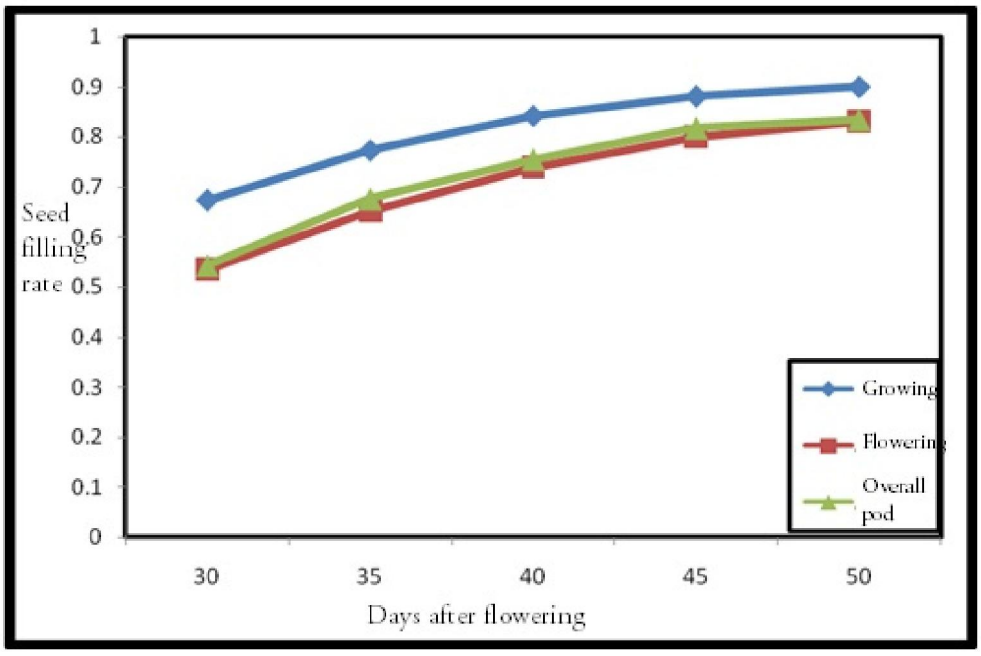

Diagram 5: Two degree Diagram the effect of hormone use time gibberellic acid on seed filling rate

The above cases with the results of Negatya and et al. (2004), Baninasab and Rahemi (1998), Mebora (1996), et al (2009) and lit and et al (2003), which stated that by providing greater leaf area exposed to sunlight will be lead to fixing the absorption of more carbon dioxide, conversely, plants that have less leaf area index, fixed less carbon dioxide and with increase in leaf area can be increased consolidation carbon dioxide in plant, with hormone use in the vegetative growth period before flowering can be achieved this positive result.

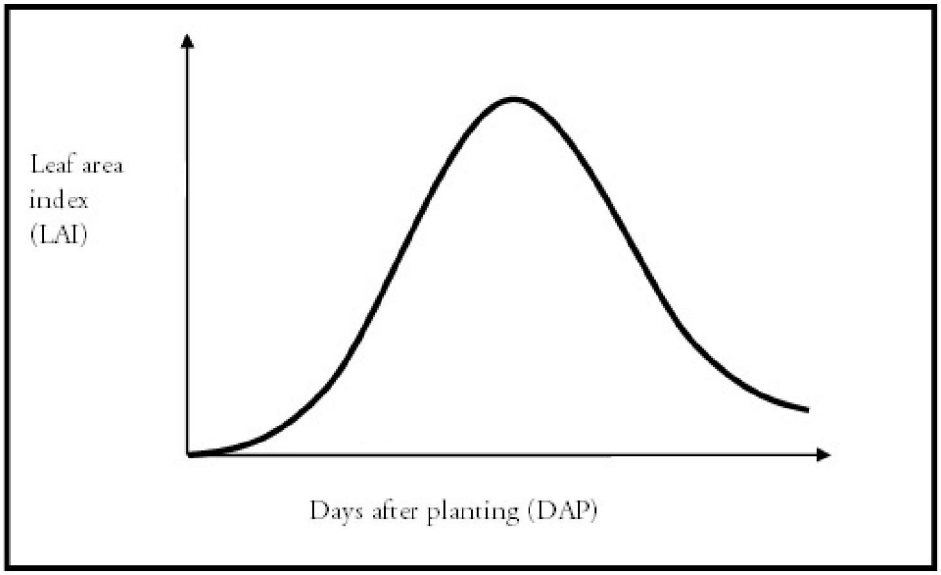

Diagram 6: The general trend leaf area index during the period of growth and development *Vicia faba L*

The correlation between traits under study

Descriptive and inferential statistical rules of interpretation of the correlation coefficient from two aspects are done. Descriptive interpretation, the intensity or weakness and direction adherence changes of the two variables reveals relative to each other. Inferential interpretation of the correlation is more reliable. Because that can be place coefficient computed as a real index of the correlation between the two variables must appear the possibility the validity of this assumption, because its opposite assumption means that the coefficient computed is caused by random factors. Thus in the inferential interpretation, of correlation coefficient existence or nonexistence of correlation between the variables is considered. The coefficient of determination or diagnosis also specifies relationship between the two variables. Results Table showed that The correlation between grain yield, plant height, number of nodes, internodes' length, number of stems, stem dry weight, leaf dry weight, pod weight, number of pods per plant, number of seeds in pod, total dry weight, harvest index, leaf area index and protein percentage on the level of one percent there was meaningful and positive correlation.

Conclusion:

1. The best time of hormone use according to grain yield is vegetative growth before flowering.
2. the most desirable level of hormone concentration gibberellic acid, due to an increase in morphological characteristics and yield components is concentration 50 ppm.
3- Whatever the plant is younger, effect of hormone gibberellic acid on quantitative and qualitative indexes will be higher, because hormone have the opportunity to effects on plant and also the plant due to more youth are impressionable.
4. Necessarily increase the hormone concentration gibberellic acid has no positive effects because higher concentrations of optimized has deterrent effect on growth.

2- suggestions:

1. It is suggested that hormone gibberellic acid in different concentrations and broader growth periods be used.
2. In addition to the 3 growth periods presented, recommended that seeds before germination being treated with the hormone gibberellic acid.
3- Move of researches from level of experimental plots to farm fields, describing the usefulness of the design on seed yield of beans and creating incentive move for farmers to control the inputs with hormone use to be considered.

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