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## INFLUENCE OF TWO CUTTING DATES AND FOLIAR SPRAY OF TRYPTOPHAN ON SOME PHYSIOLOGICAL TRAITS AND ACTIVE SUBSTANCE OF LEMON GRASS *CYMBOPOGON CITRATUS* L.

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### ABSTRACT

The experiment was carried out in the Jiman region, which is approximately 15 km north east of Kirkuk Governorate, at degrees 35, -29, 134 north and 45, -31, 164 east and at an altitude of 559 m from sea level during the agricultural season (2019/2020) To study the effect of Foliar Spray of amino acid tryptophan and two cutting dates on some physiological traits, oil yield and specific qualities of lemon grass *Cymbopogon citratus* L. By designing the randomes Block design (RCBD), with Split-Plots cut system was combined with three replicates. Four concentrations of tryptophan amino acid were used (0, 150, 250, 350) mg. L<sup>-1</sup>, since the plant was mowed during the first data in 1/6/2019 and the second on 1/8/2019, The averages were chosen according to the least significant difference test (L.S.D) to compare the arithmetic mean at the 5% probability level, and the results indicated that the date of the second Cutting date of lemon grass in physiological traits and the active substance exceeded the first date in these traits. As a result of the fact that the plants that were stuffed in the second date took their opportunity to form a strong root system that has the ability to absorb and quickly compensate the foodstuffs and convert them to the vegetative group in addition to the appropriate environmental conditions during their growth period, which was reflected in physiological characteristics and the active substance There is a steady increase in physiological traits and active substance by increasing the concentrations of the amino acid tryptophan sprinkled on lemon valerian plants due to the vital role that this acid plays in the internal physiological processes and appropriate environmental conditions for the cultivated plants. And that the increase in the concentrations of the amino acid tryptophan with plants for the second time reflected on improving the physiological characteristics and the active substance of the lemon valerian plant as a result of the compatibility of the growth of these plants with the increase in the concentrations of the amino acid of tryptophan favorable environmental conditions reflected on the plant.

**Keywords:** Lemongrass, tryptophan, Cutting dates.

### Introduction

Since the time of people circulating a very large group of plants for the purpose of treating and benefiting from healing from them, some of them are boiled and others are eaten, and some of them are mixed with other components, and the vegetable kingdom is a source of important sources in this field because the extracted materials do not have other side effects and differ from plants To the last plants on the planet (Shah, 2004), And that the benefit of these plants provides us with many benefits that we may touch each other, while others are not visible. Despite the scientific progress and scholars 'study of the benefits of many plants and the continuous increase in population numbers at the same time, which may reach eight billion people by the year 2020, and this increase will It is accompanied by other side diseases resulting from the chemical drugs manufactured, especially today (Gore), (1993) Therefore, it became necessary to go to the herbs and plants of nature because of the many therapeutic benefits and many diseases as a result of containing volatile oils, alkaloids and cyclosides (Samurai, 2000) .

Among the plants that studies have shown, which have been widely used in the field of medicinal and aromatic plants since ancient times, are the Lemon grass belonging to the Poaceae family, and the plant has great importance, as the oil contains an essential component of citral that reaches its ratio and ranges It is 90-65% and the compound Myersin 10 Myrcene -25% and Geraniol 1 Geraniol -4% of the oil components Which is distinguished by its orange-yellow color, and this oil is used in the manufacture of soap, aromatherapy and some cosmetics, as it is added to pesticides to reduce its unacceptable smell, which is also among the odor gains, so it is added to some food products. This oil is also used to treat stomach pain, headaches and joints. And rheumatism as distillation waste can be used as feed for livestock or in the manufacture of paper, as it contains limonene, geraniol and linalool and has medicinal benefits that are concentrated in the leaves, the market, and the roots (Abu Zaid, 2000), Recent research indicates that boiling lemon cannabis herb if drunk in the form of tea, it is excellent against cold cases and calming coughs, as this herb has great effects for dysuria and kidney colic and help urinary tract stones to come out as it is useful in reducing

fever and is used externally as a colchus to reduce pain in arthritis (Al-Jubouri, 2008).

That any plant, like any living organism, needs a basic compound to help it grow in addition to the rest of life's ingredients. It is well known that protein is the main component of living cells. This protein consists of peptide chains consisting of a group of amino acids. The plant creates amino acids from their primary elements, which are carbon and oxygen obtained from the carboxyl groups resulting from the photosynthesis process. They combine with the nitrogen absorbed by the plant from the soil, forming amino acids, through the complex metabolism processes inside the plant and the availability of amino acids in the desired quantities. To increase plant productivity and improve its properties, additions to amino acids depend on the extent of the plant's need for it during the different stages of growth, especially the critical stages of growth such as pollination, fertilization, nodes or exposure to any conditions of environmental stress (Tiwari *et al.*, 2018).

The stages of stuffing or cutting any part of the different organs of medicinal plants have a direct impact on the vegetative traits and active substance in the plant as well as the daily temperatures and intensity of the daily lighting and the date of planting, which may be reflected on the availability of nutrients equipped for plant growth, which reduces photosynthesis and thus a decrease The breathing process, at which time the food needed for growth will decrease, which will affect access to natural products and primary secretions, which depend on many things, including plant age, physiological maturity, plant stages and development (Abu Zaid, 2000), Based on the foregoing and the lack of studies on the lemon valerian plant, this study was applied with the aim of: stimulating the lemon valerian plant to grow and increasing the activity of the active substances and testing the efficiency of the amino acid tryptophan on the growth and yield of the active substance in the plant and determining the best spray concentration on the plant and knowing the extent of the lemon grass response to the dates Mowing and its effect on plant growth and the active ingredient of lemon grass, and reaching the best combination between the amino acid tryptophan and mowing dates to get the best growth and effective substance for the lemon grass.

### Materials and Methods

The experiment was carried out in the Jiman region near the University College Pen, which is approximately 15 kilometers northeast of Kirkuk Governorate, at degrees 35, -29, 134 north and 45, -31, 164 east and at an altitude of 559 meters from sea level during the summer agricultural season (2019 / 2020) To study the effect of tryptophan acid and mash dates on some physiological traits, oil yield and specific characteristics of lemon grass *Cymbopogon citratus* L.

Samples were randomly taken from different places of the experiment ground and mixed with organic fertilizer before the experiment was carried out and at a depth of (0-30) cm at a ratio of (2: 1). It has physical and chemical properties of the sample in the central laboratory belonging to the Kirkuk Agricultural Directorate. As it was planted behind the plants of lemon valerian at one age and one size obtained from Tikrit University / College of Agriculture / Department of Field Crops dated (1/3/2019) a month after planting (1/4/2019) I attended the concentrations of the

amino acid tryptophan (0, 150, 250, 350) mg. L<sup>-1</sup> after dissolving (1) g of amino acid tryptophan in one liter of distilled water to obtain the above concentrations Then I took the physiological measurements for the first stage after two weeks of spraying (15/4/2019) The plants of lemon grass continued to grow and took the physiological measurements for the second stage after one month from the measurements of the first stage (15/5/2019) and after the plants reached the first date required for the monster (1/8/2019) I stuffed the plants to take out the ratio of the volatile oil, its physical properties, and the active substance accumulated in the leaves, Then the plants were left for ten days to grow and sprayed with the above concentrations of the amino acid tryptophan. The plants continued to grow well. Then I took physiological measurements for the first stage of the second moment on (25/8/2019). Upon completion of the growth and the arrival of plants to the second required stage of mowing, I stuffed it on (15/11/2019) to study the ratio of the volatile oil, its physical properties and the accumulated active substance in the leaves.

The experiment was carried out by designing the complete random random sectors (RCBD) within the split-breaking system with three replicates, and each repeater contains four experimental treatments, namely (0, 150, 250, and 350) mg. L<sup>-1</sup> and a separator was set between repeaters by (1) meters. Four concentrations of tryptophan acid were used (0, 150, 250, 350 mg). L<sup>-1</sup> where the comparison treatment includes spraying with distilled water only and the plant was stuffed during the first two periods 1B on 1/8/2019 and the second blade 2B on 11/15/2019 An analysis of the chemical constituents of the volatile oil is carried out for each individual seed directly after extracting the oil with GC technology known as high sensitivity and accuracy. The following physiological characteristics (plant height, leaf area, percentage of leaves, specific leaf weight, plant relative growth rate, plant growth rate, and net rate have been studied). Photosynthesis, dry matter yield and plant dry weight) and active substance traits (Citral, Neral, Myrcene, Linanool, Limonene, Sabinine, Comphor and Penene- $\alpha$ ).

## Results and Discussion

### The vegetative traits

#### 1- Plant height (cm)

The results presented in Table (1) indicate that there are significant differences between the two mowing periods in their effect on plant height, if the second mowing period gave the highest plant height and reached (97.84) cm, while the first mowing period gave the lowest rate and reached (87.24) cm The increase in the height of the plant at the second moment and the decrease in the height of the plant at the first moment may be attributed to the appropriate environmental conditions as a result of exposure to a longer period of daily lighting and an increase in photosynthesis and the materials resulting from it. To lower plant height (Okosun *et al.*, 2006), this result is consistent with Jahangir, (2008) and Samurai, (2014).

The results showed in the same table that there were significant differences between the concentrations of the amino acid tryptophan in its effect on plant height, if the concentration gave (350) mg. L<sup>-1</sup> was the highest height and reached (96.10) cm, while comparison treatment gave the lowest value and reached (89.55) cm The increase in plant

height at the highest concentration of tryptophan may be attributed to the role of the amino acid through its ability to produce plant hormones, as this amino acid is the main material in the biological building process of oxine (IAA) This increase in plant hormones has led to another increase in the process of division Cells are elongated, elongated and larger in size, and this has positively affected plant height (Walter and Nawacki, 1978).

In the same table, the results showed that there were significant differences when overlapping between the two cultivar periods and the concentrations of the amino acid tryptophan in their effect on plant height, if the overlap gave the concentration (350) mg.L<sup>-1</sup> and the second edge the highest height of the plant and reached (100.42) cm compared to the interference when treating the comparison with the first tip that gave the lowest value and reached (83.64) cm The reason for this is due to the increased effectiveness of the treated plants compared to the non-treatment that was sprayed with different concentrations of the amino acid tryptophan, which had the highest effect at concentration (350) mg. L<sup>-1</sup>, especially at the second mowing stage. This indicates the extent of this reaction of the acid from this phase of the milling reaction.

## 2- Foliar area cm<sup>2</sup>. Plant<sup>-1</sup>

The results showed in Table (2) that there were significant differences between the two mowing periods in their effect on plant height, if the second mowing period gave the highest paper area (4606.82) cm<sup>2</sup>. Plant<sup>-1</sup> while the first mowing period gave the lowest rate and reached (3871.44) cm<sup>2</sup>. Plant<sup>-1</sup> The reason for this may be attributed to the long growth period of plants and the hours of daily lighting as well as the appropriate temperature, which gave more opportunity to the leaves of plants to grow more and expand their area, and this may reflect positively on the yield of the plant and this result is consistent with the samurai (2014).

The results also showed in the same table of the characteristics of the leafy area to the presence of significant differences between the concentrations of the amino acid tryptophan, if given the concentration (350) mg. Liters<sup>-1</sup> the highest paper area and reached (4571.28) cm<sup>2</sup>. Plant<sup>-1</sup> while the comparison treatment gave the lowest value and reached (3880.11) cm<sup>2</sup>. Plant<sup>-1</sup> The increase in the leafy area at the highest concentration of tryptophan may be attributed to the role of the amino acid through The vital role of this acid, represented by the division and elongation of cells, which led to an increase in the leafy surface of the plant, and this result came along with the height of the plant (Table 3), which confirms the effect of this acid on plant growth (Pareek *et al.*, 2000).

In the same table, the results showed that there were significant differences when overlapping between the two cultivar periods and the concentrations of the amino acid tryptophan in their effect on the leafy area, if the overlap gave the concentration (350) mg. L<sup>-1</sup> and the second edge the highest height of the plant and reached (5136.04) cm<sup>2</sup>. Plant<sup>-1</sup> as measured by interference when comparing with the first seed that gave the lowest value and reached (3630.14) cm<sup>2</sup>. Plant<sup>-1</sup> The reason for the superiority of this overlap is also due to the positive role and timing of the second mowing stage, which affected the plant when sprayed with different concentrations and the highest concentration (350) mg. L<sup>-1</sup> by increasing the accumulation of photosynthesis products that

positively affected this trait as well as this increase in the characteristics of vegetative growth may be attributed to the amino acids contained by growth regulators that have an effective role in cell division and amplitude which leads to a larger vegetative size and increases by that Of paper space (Ihsan, 1999).

## 3- Percentage of papers (%)

The data in Table (3) showed that there are significant differences between the two periods of the flock in its effect on the percentage of leaves, if the second feast period gave the highest percentage and reached (15.77)% while the first feast period gave the lowest percentage and reached (12.10)% and the reason for the increase may be attributed The percentage of leaves that were stuffed in the second date to increase the plant's life, and this came as a result of increasing the growth rates of the plant over time This is mainly due to the appropriateness of the surrounding environmental conditions (soil and water) with plants and important nutrients are available in them as this helped to continue to develop and grow which led to a positive increase for this trait (Tanjia *et al.*, 2009) This increase has been associated with an increase in the components of vegetative growth represented by plant height and area Foliar schedule (3 and 4) and the matter that led to a noticeable increase in this capacity on this date of the hay, and this result is consistent with Salman and Sajit, (2013).

The results in the same table showed the percentage of leaves attribute to the presence of significant differences between the concentrations of the amino acid tryptophan, if the concentration gave (350) mg. L<sup>-1</sup> the highest percentage of leaves and reached (14.72)% while the comparison treatment gave the lowest percentage and reached (13.37)% The reason for the increase at the highest concentration of tryptophan may be attributed to the role of this amino acid tryptophan in increasing the products of photosynthesis, which came as a result of increasing the leafy area (Table 5). Which may provide an abundance of energy and materials needed to stimulate vegetative growth of the plant, including the leaves, which led to an increase in the percentage of leaves in plants by continuing the process of cell division and building and expanding new tissues, which reflected positively on this trait (Thapa *et al.*, 2005).

The results also showed in the same table that there were significant differences when overlapping between the two seed periods and the concentrations of the amino acid tryptophan in their effect on the percentage of leaves, if the overlap gave the concentration (350) mg. The comparison transaction with the first share that gave the lowest percentage of papers and reached (11.88)% The reason for this may be due to the role of the amino acids (tryptophan), which is a basic structural unit of the protein with its multiple composition, and this increase in proteins has increased the efficiency of plants in the regularity of the biological and biological activities of the plant, which led to an increase in the number of leaves and their positive timing, especially at the second stage.

## 4- Specific paper weight (gm.plant<sup>-1</sup>).

The data in Table (4) showed that there were significant differences between the two grass periods in their effect on the specific leaf weight, if the second bath period gave the highest specific weight of the leaf and reached (0.93) gm.

Plant<sup>-1</sup> while the first bath period gave the lowest weight and reached (0.86) gm. Plant<sup>-1</sup> The reason for the increased weight of the specific leaf that was stuffed in the second date may be attributed to the increase in the growth rates of the plant, including the leafy area and the percentage of leaves table (4 and 5), which led to a positive increase for this quality and at this time of the harvest.

The results showed in the same table of the specific weight of the leaf weight to the presence of significant differences between the concentrations of the amino acid tryptophan, if the concentration (350) g.L<sup>-1</sup> gave the highest specific weight of the paper and reached (0.93) gm. Plant<sup>-1</sup> while the comparison treatment gave the lowest specific weight For the paper, it reached (0.86) gm. Plant<sup>-1</sup> The reason for the increase at the highest concentration of tryptophan is due to the role of this amino acid tryptophan in increasing the products of photosynthesis and increasing the level of amino and nucleic acids and manufacturing the necessary proteins that stimulate the process of cell division, which has increased the growth components, especially the leafy area Table (4), which led to a positive increase For this trait and in this concentration of tryptophan.

The results also showed in the same table that there were significant differences when overlapping between the two cultivar periods and the concentrations of the amino acid tryptophan in its effect on the specific leaf weight, if the overlap gave the concentration (350) mg. 1 Measuring the interference when treating the comparison with the first tip that gave the lowest weight and reached (0.84) gm. Plant<sup>-1</sup> The reason for this is in addition to the appropriate date for mowing that the amino acids, including tryptophan, are rich in the necessary elements, especially nitrogen, which is included in the composition of DNA and RNA and the proteins and enzymes that accompany them, which contributed to the processes of division, elongation and activation of various biological processes, which led to increased indicators of vegetative growth, including the leafy area Table (4), which positively affected this trait.

##### 5- The relative growth rate of the plant (mg.day<sup>-1</sup>).

The data in Table (5) showed that there were significant differences between the two mowing periods in their effect on the relative growth rate of the plant, if the second mowing period gave the highest relative growth rate of the plant and reached (0.042) mg.Day<sup>-1</sup> while the first mowing period gave the lowest rate and reached (0.032) mg.Day<sup>-1</sup> The reason for this may be attributed to the date of the second period, which may be due to the increase in the dry weight of the plants by increasing the greenery schedule (3, 4 and 5), which came as a result of the appropriate environmental conditions through the appropriate date of cultivation and the length of the growing season and the accumulation of these quantities more in this The date which positively reflected on this trait (Al Doghachi and Matroad, 2016).

In the same table data, the results of the relative growth rate of the plant showed a significant difference between the concentrations of the amino acid tryptophan, if the concentration (350) g.L<sup>-1</sup> gave the highest growth rate and reached (0.040) mg.Day<sup>-1</sup> while the comparison treatment gave the lowest value It reached (0.034) mg.Day<sup>-1</sup> The reason for the increase at the highest concentration of tryptophan may be attributed to the fact that the amino acids, including tryptophan, contain hormones, oxins, and other growth

regulators that interfere with each other through physiological processes and the divisions they cause and allocate plant cells as well as the strength of the root system of the plant, which leads to increased The ability of the plant to absorb nutrients, which leads to an increase in photosynthesis products in the process of manufacturing nutrients and their accumulation in plants, thus increasing the dry weight of the plant, which positively reflected on this trait (Crouch and Staden, 1991).

The results also showed in the same table that there were significant differences when overlapping between the two cultivar periods and the concentrations of the amino acid tryptophan in their effect on the relative growth rate of the plant, if the overlap gave the concentration (350) mg. L<sup>-1</sup> and the second moment the highest relative growth rate of the plant and reached (0.047) mg.Day<sup>-1</sup> compared to the interference when the comparison treatment with the first moment that gave the lowest value and reached (0.031) mg.Day<sup>-1</sup> and the reason may be due to the increase in the rates of transactions and their superiority at the stage The second spray was significantly superior compared to the no-spray treatment.

##### 6- Plant growth rate (mg. Cm<sup>-2</sup> day<sup>-1</sup>).

The data in Table (6) showed that there were significant differences between the two mowing periods in their effect on the growth rate of the plant, if the second mowing period gave the highest growth rate of the plant and reached (0.0034) mg. Cm<sup>-2</sup> day<sup>-1</sup> while the first mowing period was given the lowest The rate was (0.0019) mg. Cm<sup>-2</sup> day<sup>-1</sup> The reason for this may be attributed to the increase in the vegetative growth components of the plants that were stuffed in the appropriate time (Table 3, 4 and 5), which is due to the length of the growth period and exposure to lighting, which gave the plant a longer time for growth, development and absorption of nutrients, which consist of nutrients. The plant, on the contrary, in plants was stuffed on the first date (Al Doghachi and Matroad, 2016).

In the same table data, the results showed that the growth rate of the plant showed a significant difference between the concentrations of the amino acid tryptophan, if the concentration (350) g.L<sup>-1</sup> gave the highest plant growth rate and reached (0.0035) mg. Cm<sup>-2</sup> day<sup>-1</sup> while it gave The comparison transaction was the lowest value and reached (0.0020) mg. Cm<sup>-2</sup> day<sup>-1</sup> The reason for the increase at the highest concentration of tryptophan may be attributed to the percentage of leaves, the specific leaf weight and the relative growth rate of the plant table (5, 6 and 10) due to its superiority in these traits, which was positively reflected on this trait and this result is consistent with Wahba *et al.* (2015)

The results also showed in the same table that there were significant differences when overlapping between the two cultivar periods and the concentrations of the amino acid tryptophan in their effect on the growth rate of the plant, if the overlap gave the concentration (350) mg. L<sup>-1</sup> and the second moment the highest growth rate of the plant reached (0.0048) mg. Cm<sup>-2</sup> day<sup>-1</sup> Measuring the interference when treating the comparison with the first seed that gave the lowest value for the plant growth rate and reached (0.0017) mg. Cm<sup>-2</sup> day<sup>-1</sup> This confirms the response of plants to spraying with the amino acid tryptophan, especially at concentration (350) g.Plant<sup>-1</sup> in the stage The second

grouping, which led to an increase in growth components, and this had a positive impact on this trait.

### 7- The rate of net photosynthesis (mg. Cm<sup>-2</sup> day<sup>-1</sup>)

The data in Table (7) showed that there are significant differences between the two periods of the fennel in its effect on the rate of net photosynthesis, if the second feast period gave the highest rate of net photosynthesis and reached (0.18) mg. Cm<sup>-2</sup> day<sup>-1</sup> while the feast period was given The first was the lowest rate of (0.14) mg. Cm<sup>-2</sup> day<sup>-1</sup> The reason for the increase in the rate of net photosynthesis that was stuffed in the second date may be attributed to the appropriate environmental conditions, as it led to the length of the vegetative growth period and the duration of exposure to lighting, which was associated with the components of vegetative growth represented by plant height, leaf area, and the percentage of leaves in the plant (Table 3 and 4). 5) The matter that led to this attribute being increased at this time of mowing (Naidu *et al.*, 1992).

The results showed in the same table of the characteristics of the net rate of photosynthesis to the presence of significant differences between the concentrations of the amino acid tryptophan, if the concentration (350) g.L<sup>-1</sup> gave the highest rate and it reached (0.17) mg. cm<sup>-2</sup> day<sup>-1</sup> while the comparison treatment was given The lowest value was (0.15) mg. cm<sup>-2</sup> day<sup>-1</sup> The reason for the increase at the highest concentration of tryptophan may be attributed to the fact that this amino acid tryptophan stimulates the plant and supplies it with the elements necessary for long-term growth and the entry of these elements into photosynthesis, which led to the relative growth rate of the plant and the specific leaf weight table (5, 6 and 7) due to the increase The components of vegetative growth, including the height of the plant, the leafy area and the proportion of leaves in the plant Table (3, 4 and 5), which were reflected positively on this trait (Gill and Tuteja, 2010).

The results also showed in the same table that there were significant differences when overlapping between the two periods of ammonia and the concentrations of the amino acid tryptophan in their effect on the rate of net photosynthesis, if the overlap gave the concentration (350) mg. Cm<sup>-2</sup> day<sup>-1</sup> compared to the interference when treating the comparison with the first group that gave the lowest value for the net photosynthesis rate and reached (0.13) mg. cm<sup>-2</sup> day<sup>-1</sup> This increase is the result of an increase in growth rates, especially the leafy area, chlorophyll A, B and total In the plant (4, 5, 8, and 9) which helped to increase this characteristic.

### 8- Duration of dry matter production (g. Measurement period -1)

The data in Table (8) showed that there are significant differences between the two cultivar periods in their effect on the duration of the dry material production stay, if the second bath period gave the highest period for the dry material production stay and reached (4625.22) g. Measurement period<sup>-1</sup> while the first bath period was given The lowest average was (3903.26) gm. Duration of measurement<sup>-1</sup> The reason for this may be attributed to the increase in the dry weight of plants at the time of the second moment, may be due to the age of the plant, which may increase the completion of its growth, size and branches, and increase the branches and leaves and increase the leaf area in the plants of

the second date, in addition to increasing physiological indicators, the relative growth rate and the rate of crop growth. Table (10, 11, and 12) as well, thus increasing the drying life of dry matter production (Kmieciak *et al.*, 2002).

The results also showed in the same table of the description of the duration of the dry matter production period to the presence of significant differences between the concentrations of the amino acid tryptophan, if the concentration gave (350) gm. L<sup>-1</sup> the highest period and reached (4496.57) g. duration of the measurement<sup>-1</sup>, while the comparison treatment was given lower The value reached (4007.56) g. Duration of the measurement<sup>-1</sup> The increase in the dry weight of the plant at the highest concentration of tryptophan may be attributed to the fact that amino acids, including tryptophan, supply plant cells with the nitrogen component directly and this nitrogen can be taken by the plant faster than inorganic nitrogen, which leads to stimulating growth, elongation and control of the use of nutrients for plant development. On a regular and balanced basis, then facilitating the biological processes in order to obtain the dry matter during a certain period of time that affects the quality and productivity of the plant, which was positively reflected on this trait (Steeve, 2003). In addition, spraying the plant with the amino acid tryptophan led to an increase in the efficiency of the plant And improve his physiological characteristics Table (7, 8, 10, 11 and 12).

The results also showed in the same table that there were significant differences when overlapping between the two cultivar periods and the concentrations of the amino acid tryptophan in their effect on the duration of dry matter production, if the overlap gave the concentration (350) mg. L<sup>-1</sup> and the second moment the highest duration was (4996.83) g. Measurement duration<sup>-1</sup> Measured by interference when comparing with the first batch that gave the lowest value and reached (3772.44) g. Measurement period<sup>-1</sup> The reason for the superiority of this interference may be due to the superiority of the transactions in an image Individually, which reflected positively on this trait.

### 9- Dry weight of a plant (Gm. Plant<sup>-1</sup>).

The data in Table (9) showed that there were significant differences between the two mowing periods in their effect on the dry weight of the plant, if the second mowing period gave the highest dry weight of the plant and reached (231.49) gm. Plant<sup>-1</sup> while the first mowing period gave the lowest rate and reached (192.24) gm. Plant<sup>-1</sup> The reason for this may be attributed to the increase in the dry weight of plants at the time of the second moment, possibly due to the length of the growth period through exposure to daily lighting, which led to giving the plant a longer period of growth, development, absorption of nutrients and an increase in the vegetative total. Plant height Table (3) and leafy area Table (4) photosynthesis Photosynthesis, as well as the accumulation of photosynthesis products in the plant by increasing metabolism in them, which can be composed with the necessary nutrients, the dry matter in the plant, and contrary to that at the date of the first moment, schedule (5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16) This finding is consistent with Salman and Sajit (2013).

The results also showed in the same table for the dry weight of the plant, that there were significant differences between the concentrations of the amino acid tryptophan in its effect on the dry weight of the plant, if the concentration

gave (350) g.L<sup>-1</sup> the highest dry weight of the plant amounted to (228.07) gm. Plant<sup>-1</sup> While the comparison treatment gave the lowest value and reached (194.67) gm. Plant<sup>-1</sup> The increase in the dry weight of the plant at the highest concentration of tryptophan may be attributed to the increase in the height of the plant, the leafy area and the percentage of leaves in the plant Tables (3, 4 and 5), in addition to the role of this acid and its effect in building large particles as it increases the nucleic acids and stimulates various physiological processes And associated with building proteins and stimulating cell divisions and all these processes have positively reflected on this adjective table (6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16).

The results also showed in the same table that there were significant differences when overlapping between the two cultivar periods and the concentrations of the amino acid tryptophan in its effect on the dry weight of the plant, if the overlap gave the concentration (350) mg. Liters<sup>-1</sup> and the second moment the highest height of the plant and reached (258.42) gm. Plant<sup>-1</sup> compared to the interference when treatment compared with the first moment that gave the lowest value and reached (188.22) gm. Plant<sup>-1</sup> that the reason for that is due to the positive role when the workers overlap together This result is consistent with the paint, (2015).

#### Active substance: (results):

##### 1- Citral (ppm)

The results presented in Table (10) indicated that there were significant differences between the two periods in the effect of mowing in its effect on Citral, if the second mowing period gave the highest Citral and reached (63.12) ppm, while the first mowing period gave the lowest rate and reached (60.53) ppm, and from the same table there were Significant differences between the concentrations of the amino acid tryptophan in its effect on Citral, if the concentration gave (350) mg. L<sup>-1</sup> has the highest rate (66.70) ppm, while comparison treatment gave the lowest value and reached (56.93) ppm.

While the results of the interference showed that there were significant differences between the two cultivar periods and the concentrations of the amino acid tryptophan in their effect on Citral, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second pin is higher than Citral and reached (70.33) ppm compared to the interference when treating the comparison with the first tip that gave the lowest value and reached (55.86) ppm.

##### 2- Neral (ppm)

The results presented in Table (11) indicated that there were significant differences between the two periods in the effect of the ferment in its effect on Neral. Among the concentrations of the amino acid tryptophan in its effect on Neral, if the concentration gave (350) mg. L<sup>-1</sup> has the highest rate (39.83) ppm, while comparison treatment gave the lowest value and reached (33.96) ppm.

As for the interference, the results from the same table showed that there were significant differences between the two cultivar periods and the concentrations of the amino acid tryptophan in their effect on Neral, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second pin higher than Neral and reached (42.90) ppm compared to the interference when treating the comparison with the first tip that gave the lowest value and reached (31.86) ppm.

##### 3- Myrcene (ppm)

The results presented in Table (12) showed that there were significant differences between the two periods in the effect of mowing in its effect on Myrcene. Significant differences between the concentrations of the amino acid tryptophan in its effect on Myrcene, if the concentration gave (350) mg. L<sup>-1</sup> was the highest rate (6.91) ppm, while comparison treatment gave the lowest value and reached (4.75) ppm

With regard to the interference, the results from the same table showed that there were significant differences between the two periods of turf and the concentrations of the amino acid tryptophan in their effect on Myrcene, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second batch was higher than Myrcene and reached (7.63) ppm when compared to the comparison treatment with the first batch, which gave the lowest value and reached (4.43) ppm.

##### 4- Linalool (ppm)

The results presented in Table (13) showed that there were significant differences between the two periods in the effect of bed in the effect on Linalool, if the second bed period gave the highest Linalool and reached (1.97) ppm, while the first bed period gave the lowest rate and reached (1.31) ppm, and from the same table there were Significant differences between the concentrations of the amino acid tryptophan in its effect on Linalool, if the concentration gave (350) mg. L<sup>-1</sup> was the highest rate (2.26) ppm, while comparison treatment gave the lowest value and reached (1.10) ppm.

As for the interference, the results from the same table showed that there were significant differences between the two periods of the hay and the concentrations of the amino acid tryptophan in its effect on Linalool, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second batch was higher than Linalool and it reached (2.96) ppm compared to the interference treatment when compared to the first batch that gave the lowest value and reached (0.80) ppm.

##### 5- Limonene (ppm)

The results presented in Table (14) showed that there were significant differences between the two grass periods in its effect on Limonene, if the second bed period gave the highest Limonene and reached (3.44) ppm, while the first bed period gave the lowest rate and reached (2.90) ppm, and from the same table there were Significant differences between the concentrations of the amino acid tryptophan in its effect on Limonene, if the concentration gave (350) mg. L<sup>-1</sup> has the highest rate and reached (3.73) ppm, while comparison treatment gave the lowest value and reached (2.63) ppm.

With regard to the interference, the results from the same table showed that there were significant differences between the two periods of turf and the concentrations of the amino acid tryptophan in its effect on Limonene, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second edge is higher than Limonene and reached (4.36) ppm when compared to the comparison treatment with the first edge that gave the lowest value and reached (2.46) ppm.

##### 6- Sabinen (ppm)

The results presented in Table (15) showed that there were significant differences between the two bed periods in

their effect on Sabinen, if the second bed period gave the highest Sabinen and reached (1.63) ppm, while the first bath period gave the lowest rate and reached (0.94) ppm, and from the same table there were Significant differences between the concentrations of the amino acid tryptophan in its effect on Sabinen, if the concentration gave (350) mg. L<sup>-1</sup> was the highest rate (1.85) ppm, while comparison treatment gave the lowest value and reached (0.83) ppm.

As for the interference, the results from the same table showed that there were significant differences between the two periods of the hay and the concentrations of the amino acid tryptophan in its effect on Sabinen, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second edge above Sabinen reached (2.60) ppm compared to the interference treatment when compared to the first piece that gave the lowest value and reached (0.60) ppm.

### 7- Camphor (ppm)

The results presented in Table (16) showed that there were significant differences between the two periods of the cannabis in its effect on Camphor, if the second hash period was given above Camphor and reached (2.20) ppm, while the first hash period gave the lowest rate and reached (1.41) ppm, and from the same table there were Significant differences between the concentrations of the amino acid tryptophan in its effect on Camphor, if the concentration gave (350) mg. L<sup>-1</sup> has the highest rate and reached (2.20) ppm, while the comparison treatment gave the lowest value and reached (1.35) ppm.

With regard to the interference, the results from the same table showed that there were significant differences between the two periods of turf and the concentrations of the amino acid tryptophan in their effect on Camphor, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second edge is higher than Camphor, and it reached (2.90) ppm compared to the interference treatment when compared to the first moment, which gave the lowest value and reached (1.10) ppm.

### 8- $\alpha$ -pinen (ppm)

The results presented in Table (17) showed that there were significant differences between the two mowing periods in their effect on  $\alpha$ -pinen, if the second mowing period gave the highest  $\alpha$ -pinen and reached (1.72) ppm, while the first mowing period gave the lowest rate and reached (1.15) ppm, and from The same table, there were significant differences between the concentrations of the amino acid tryptophan in its effect on  $\alpha$ -pinen, if the concentration gave (350) mg. L<sup>-1</sup> was the highest rate (1.95) ppm, while comparison treatment gave the lowest value and reached (0.95) ppm.

With regard to the interference, the results from the same table showed that there were significant differences between the two shoots and the concentrations of the amino acid tryptophan in their effect on  $\alpha$ -pinen, if the interference gave the concentration (350) mg. L<sup>-1</sup> and the second batch were higher than  $\alpha$ -pinen and reached (2.56) ppm compared to the interference treatment when compared to the first batch that gave the lowest value and reached (0.80) ppm.

**Table 1 :** Effect of mowing and spraying periods with different concentrations of tryptophan on plant height, cm<sup>-1</sup>.

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	83.646	85.560	87.990	91.780	87.244
second session 11/15/2019	95.460	97.313	98.190	100.423	97.846
Average tryptophan	89.553	91.436	93.090	96.101	
L.S.D values	Tryptophan = 0.210      Two mowing periods = 0.113 Interference between mowing and tryptophan = 0.297				

**Table 2 :** The effect of mowing and spraying periods with different concentrations of tryptophans in the leafy area Cm<sup>-2</sup>, plant<sup>-1</sup>.

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	3630.14	3891.64	3957.44	4006.52	3871.44
second session 11/15/2019	4130.08	4373.33	4787.84	5136.04	4606.82
Average tryptophan	3880.11	4132.48	4372.64	4571.28	
L.S.D values	Tryptophan = 5.817      Two mowing periods = 4.064 Interference between mowing and tryptophan = 8.227				

**Table 3 :** Effect of the hash and spray periods with different concentrations of tryptophan on the percentage of leaves (%).

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	11.88	11.96	11.98	12.57	12.10
second session 11/15/2019	14.87	15.37	15.76	16.86	15.71
Average tryptophan	13.37	13.66	13.87	14.72	
L.S.D values	Tryptophan = 0.011      Two mowing periods = 0.037 Interference between mowing and tryptophan = 0.016				

**Table 4 :** Effect of the spray and spray periods with different concentrations of tryptophan on the specific weight gm. Plant<sup>-1</sup>.

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	0.84	0.85	0.87	0.88	0.86
second session 11/15/2019	0.88	0.93	0.95	0.97	0.93
Average tryptophan	0.86	0.89	0.91	0.93	
L.S.D values	Tryptophan = 0.001      Two mowing periods = 0.0009 Interference between mowing and tryptophan = 0.0014				

**Table 5 :** Effect of mowing and spraying periods with different concentrations of tryptophan on the relative growth rate of the plant (mg.Day<sup>-1</sup>).

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	<b>0.031</b>	<b>0.031</b>	<b>0.033</b>	<b>0.034</b>	<b>0.032</b>
second session 11/15/2019	<b>0.038</b>	<b>0.041</b>	<b>0.042</b>	<b>0.047</b>	<b>0.042</b>
Average tryptophan	<b>0.034</b>	<b>0.036</b>	<b>0.038</b>	<b>0.040</b>	
L.S.D values	Tryptophan = 0.0002      Two mowing periods = 0.0003 Interference between mowing and tryptophan = 0.0002				

**Table 6 :** Effect of mowing and spraying periods with different concentrations of tryptophan on plant growth rate (mg. cm<sup>-2</sup> day<sup>-1</sup>)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	0.0017	0.0018	0.0019	0.0021	0.0019
second session 11/15/2019	0.0023	0.0026	0.0038	0.0048	0.0034
Average tryptophan	0.0020	0.0022	0.0028	0.0035	
L.S.D values	Tryptophan = 0.0001      Two mowing periods = 0.0001 Interference between mowing and tryptophan = 0.0002				

**Table 7 :** Effect of mowing and spraying periods in different concentrations of tryptophan on the rate of net photosynthesis (mg. cm<sup>-2</sup> day<sup>-1</sup>)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	<b>0.13</b>	<b>0.13</b>	<b>0.14</b>	<b>0.15</b>	<b>0.14</b>
second session 11/15/2019	<b>0.17</b>	<b>0.18</b>	<b>0.19</b>	<b>0.19</b>	<b>0.18</b>
Average tryptophan	<b>0.15</b>	<b>0.16</b>	<b>0.16</b>	<b>0.17</b>	
L.S.D values	Tryptophan = 0.0003      Two mowing periods = 0.0009 Interference between mowing and tryptophan = 0.0009				

**Table 8 :** Effect of the spray and spray periods with different concentrations of tryptophan on the dry matter life time (g. Measurement period<sup>-1</sup>)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	3772.44	3890.37	3953.94	3996.30	3903.26
second session 11/15/2019	4242.67	4578.18	4683.21	4996.83	4625.22
Average tryptophan	4007.56	4234.27	4318.57	4496.57	
L.S.D values	Tryptophan = 3.933      Two mowing periods = 7.257 Interference between mowing and tryptophan = 5.562				



**Table 9 :** Effect of mowing and spraying periods with different concentrations of tryptophan on dry weight of a plant (gm. Plant<sup>-1</sup>)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	188.22	191.11	191.91	197.72	192.24
second session 11/15/2019	201.12	225.73	240.72	258.42	231.49
Average tryptophan	194.67	208.42	216.31	228.07	
L.S.D values	Tryptophan = 0.557      Two mowing periods = 1.165 Interference between mowing and tryptophan = 0.788				

**Table 10 :** Effect of mowing and spraying periods with different tryptophan concentrations in Citral (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	55.86	57.96	65.23	63.06	60.53
second session 11/15/2019	58.00	58.43	65.73	70.33	63.12
Average tryptophan	56.93	58.20	65.48	66.70	
L.S.D values	Tryptophan = 0.569      Two mowing periods = 1.201 Interference between mowing and tryptophan = 0.805				

**Table 11 :** Effect of the spray and spray periods with different concentrations of tryptophan in Neral (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	31.86	34.20	38.46	36.76	35.32
second session 11/15/2019	36.06	37.53	41.03	42.90	39.38
Average tryptophan	33.96	35.86	39.75	39.83	
L.S.D values	Tryptophan = 0.639      Two mowing periods = 1.104 Interference between mowing and tryptophan = 0.904				

**Table 12 :** Effect of the spray and spray periods with different tryptophan concentrations in Myrcene (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	4.43	5.26	6.66	6.20	5.64
second session 11/15/2019	5.06	5.26	6.90	7.63	6.21
Average tryptophan	4.75	5.26	6.78	6.91	
L.S.D values	Tryptophan = 0.228      Two mowing periods = 0.215 Interference between mowing and tryptophan = 0.323				

**Table 13 :** Effect of the spray and spray periods at different concentrations of tryptophan in Linalool (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	0.80	1.13	1.76	1.56	1.31
second session 11/15/2019	1.40	1.40	2.13	2.96	1.97
Average tryptophan	1.10	1.26	1.95	2.26	
L.S.D values	Tryptophan = 0.141      Two mowing periods = 0.156 Interference between mowing and tryptophan = 0.2				

**Table 14 :** The effect of mowing and spraying periods with different tryptophan concentrations in Limonene (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	2.46	2.73	3.30	3.10	2.90
second session 11/15/2019	2.80	2.70	3.90	4.36	3.44
Average tryptophan	2.63	2.71	3.60	3.73	
L.S.D values	Tryptophan = 0.110      Two mowing periods = 0.258 Interference between mowing and tryptophan = 0.156				

**Table 15 :** Effect of the spray and spray periods with different tryptophan concentrations in Sabinen (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	0.60	0.80	1.26	1.10	0.94
second session 11/15/2019	1.06	1.06	1.80	2.60	1.63
Average tryptophan	0.83	0.93	1.53	1.85	
L.S.D values	Tryptophan = 0.110      Two mowing periods = 0.258 Interference between mowing and tryptophan = 0.156				

**Table 16 :** Effect of the spray and spray periods at different concentrations of tryptophan in Camphor (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	1.10	1.36	1.70	1.50	1.41
second session 11/15/2019	1.60	1.86	2.46	2.90	2.20
Average tryptophan	1.35	1.61	2.08	2.20	
L.S.D values	Tryptophan = 0.100      Two mowing periods = 0.318 Interference between mowing and tryptophan = 0.142				

**Table 17 :** Effect of the spray and spray periods at different concentrations of tryptophan in  $\alpha$ -pinen (ppm)

Concentration of tryptophan	Concentration 0 Mg.L <sup>-1</sup>	Concentration 150 Mg.L <sup>-1</sup>	Concentration 250 Mg.L <sup>-1</sup>	Concentration 350 Mg.L <sup>-1</sup>	Average shoots
Two shift periods					
First moment 1/8/2019	0.80	0.10	1.50	1.33	1.15
second session 11/15/2019	1.10	1.36	1.86	2.56	1.72
Average tryptophan	0.95	1.18	1.68	1.95	
L.S.D values	Tryptophan = 0.088      Two mowing periods = 0.143 Interference between mowing and tryptophan = 0.125				

## Discussion

From the table (21, 22, 23, 24, 25, 26 and 27) the reason for the superiority of the second stalk over the first stems is due to the long lighting period and the temperature variation experienced by the plant, which affected the extent of the synthesis of active compounds and their chemical compositions as a result of vital activities That occur within plants, including photosynthesis, which led to an increase in the construction of secondary compounds, as well as the conversion of some oxygenic compounds, which have formed the pilot oil and have been converted to other compounds, which led to the lower rates of these compounds in the first moment.

As for the concentrations of the amino acid tryptophan, the reason for the superior concentration may be (350) mg. L<sup>-1</sup> in it to the effectiveness of the amino acid in stimulating the physiological and biological processes of the plant and increasing the metabolic processes that result in an increase in the accumulation of citral compound and the same physiochemical behavior which was confirmed by (Akeel and Alsammari, 2019) in their study on the basil plant.

As for the interference, the results from the same table showed between the two periods of the cultivar and the concentrations of the amino acid tryptophan in its effect on the active substance. The superiority of the concentration may be due to (350) mg. L<sup>-1</sup> at the second moment to the biological and physiological role in the enzymes within the tissue of living plants by stimulating the formation of nucleic acids (DNA and RNA) and carrying them (tRNA), which has

positively reflected in the process of photosynthesis and its efficiency, which led to this increase in the amount of stored materials, which In turn, it affected the productivity of the active substance in the plant. The reason may also be due to the fact that the lemon valerian plant has responded positively from the amino acid tryptophan by achieving a high net of the products of photosynthesis as well as increasing the accumulation of oxygens, which led to an increase in the production of active compounds resulting through the primary metabolic pathway (COA). -Acetyl) through the Mevalonic acid course.

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