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The effect of caffeine and nicotine on different plants growth

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ABSTRACT

This study was carried out to show the effect of nicotine on different plants. For this experiment, we use two plants Trigonellafoenum-graecum & Mustard Brassica.juncea as they are fast growing plants. The source of nicotine was BEEDI (local cigarette) & KK (pan masala). Three -three pots taken for each plants Trigonellafoenum-graecum & mustard Brassica.juncea. Trigonellafoenum-graecum for taken 3 pots one for normal, one for kk, one for beedi same is taken for mustard Brassica juncea. An equal amount of water is given on a daily basis & equal environmental condition was provided. It shows that beedi & kk enhance the growth of plants as compared with normal plants. The purpose of this experiment is to see whether coffee and cigarette can make a plant grow taller within 10 days. This experiment was done by using mung bean (Vigna.radiata L) plants and watering them daily with normal water, water mixed with caffeine and with a coffee mixture. The height of the plant was measured as a daily parameter to check the effect on growth. On the fifteenth day of germination, the plant was removed to evaluate dry weight and spectrophotometric measurement for chlorophyll content. The result of the experiment found that caffeine with low amount gives best results which can be reconfirmed by height, chl a, b, carotenoid estimation. The result indicates that mung bean grows faster in soil with caffeine. The effect of nicotine on plant growth (fenugreek seeds) by using cigarette and chewing tobacco. Nicotine is an addictive drug that is found mostly in cigarettes, cigar, chewing snuff. Cigarette and chewing tobacco contain thousands of chemical compound but nicotine is a major constituent of cigarette and tobacco, kills insect pests and used in many organic insecticides to protect plants. Our study investigated the impact of pure tobacco (chewing) and a cigarette on seed germination of fenugreek. The result showed that if we use a cigarette, the plant will grow taller” as compared to the normal plant. But there was a significant decrease in germination rate or growth at pure tobacco or at high concentration of tobacco Qualitative test perform to check the presence of carbohydrate and protein which gives a positive result. Different concentration of bidi and kk used to check their effect on plant growth. Concentration like 1%, 2% & 3%. Kk shows the highest growth at 3% then 1%&least on 2%.In nicotine shows the highest growth at 3%then 2%&1%.

Keywords: Caffeine, Nicotine, Brasicca, Juncea

1. INTRODUCTION

1.1 Caffeine

In today's world, caffeine is more popular than ever before. In fact, more than 120,000 tons of caffeine are consumed worldwide each year. This goes towards drinks such as coffee and tea, as well as popular foods such as chocolate. Caffeine is a complex compound and probably one of the most researched components of the diet. This experiment was performed to find out the effect of adding caffeine to soil and its effect on plant growth. Some plants seem to benefit and grow faster when caffeine is added to the soil, while others seem to become stunted or grow slower. There are also some plants that are not affected by the presence of caffeine in the soil. Caffeine can be introduced to the soil by sprinkling grounded coffee over the soil, adding leftover coffee to the pot or watering with a caffeine solution made by dissolving a caffeine bean powder in water. The grounded coffee is actually organic matter and will help in adding nutrients to the soil. It will also attract worms that feed on grounded coffee and at same time help to aerate the soil.

1.2 Nicotine

Nicotine, the active ingredient in tobacco is second only to caffeine as the most widely used central nervous systems stimulant. In combination with the tars and carbon monoxide in cigarette smoke and it represents a serious health risk but however, is approved by the FDA as an insecticide. Another experiment was carried out to show that the effect of nicotine on plant growth. And nicotine substance has found it actually has a positive effect on plant growth.

Studies on nicotine as an isolated substance have found it actually may have a positive effect on plant growth. Nicotine was identified chemically in the nineteenth century. Nicotine is an alkaloid produced in tobacco roots and transmitted to the leaves. It can also be used as a stimulant which will help the plant to grow at a faster rate. Here nicotine has a positive impact on the growth

of the plant as it enhances the growth. Nicotine act as a pesticide for several years. Nicotine, a toxic chemical most often associated with cigarettes, has been used as an insecticide since colonial times.

Studies on nicotine as an isolated substance have found it actually may have a positive effect on plant growth. Nicotine was identified chemically in the nineteenth century. Nicotine is an addictive drug that is found mostly in beedi cigarettes, cigars, and chewing snuff. Nicotine is composed of several chemicals that have strong effects on the human body together and can cause nicotine overdose. Nicotine has an adverse effect on the human body and can lead to cancer especially mouth cancer. Nicotine is an alkaloid produced in tobacco roots and transmitted to the leaves. It can also be used as a stimulant which will help the plant to grow at a faster rate. Here nicotine has a positive impact on the growth of the plant as it enhances the growth. Nicotine act as a pesticide for several years. Nicotine, a toxic chemical most often associated with cigarettes, has been used as an insecticide since colonial times. One excellent benefit of using nicotine in your garden is that its effectiveness is short-lived but potent. You can kill the critters that damage your plants while saving the ones that protect them. Only a few hours after spraying, you can harvest and eat your vegetables.

Trigonella foenum-graecum is an annual plant in the family Fabaceae, with leaves consisting of three small obovate to oblong leaflets. It is cultivated worldwide as a semi-arid crop.

Constituents of fenugreek seeds include flavonoids, alkaloids, coumarins, vitamins, and saponins; the most prevalent alkaloid is trigonelline and coumarins include cinnamic acid and scopolamine. In traditional medicine, fenugreek is thought to promote digestion, induce labor, and reduce blood sugar levels in diabetics, although the evidence for these effects is lacking. Per 100 g, fenugreek leaves provide 210 kilojoules (49 kcal) and contain 89% water, 6% carbohydrates, 4% protein and less than 1% fat, with calcium at 40% of the Daily Value.

2. MATERIAL AND METHOD USE

Reagent use: phosphate buffer, alkaline sodium carbonate, folin’s reagent, 20% TCA, acetone, 0.1N NaOH, bovine serum albumin(BSA), alkaline copper sulphate, 0.2% ninhydrin, molish reagent, conc. Sulphuric acid, distilled water, petroleum ether, methanol, diethyl ether, 30%KOH methanol.

Soil, water, pots, *Vigna radiate* L, *Trigonellafoenum-graecum* seeds, coffee(Nescafe sunrise) and coffee bean powder, cigarette and chewing tobacco(local tobacco packet) both are nicotine source, plant extract, mustard *Brassica juncea* seeds, beedi (local cigarette), KK (pan masala) both are nicotine source, plant extract.

3. METHOD

1. Six pots took, 3 pots for *Vigna radiate* L with the equal amount of soil and fifteen beans in each pot AND 3 Pots for *trigonellafoenum-graecum* with the equal amounts of soil, seeds.
2. Three pots of *Vigna radiate* L, One pot watered with normal water, pot 2 with a coffee solution, pot 3 with caffeine bean powder solution with the equal amount as well as the environmental condition is provided.
3. Three pots of *Trigonellafoenum-graecum*, 1 pot containing normal soil, pot 2 containing soil with a cigarette, pot 3 containing soil with chewing tobacco with an equal amount of water as well environmental condition is provided.
4. Six pots took. 3 for *Trigonella foenum-graecum* & 3 for mustard *Brassica juncea*.
5. For *Trigonella foenum-graecum* pot 1 containing normal soil, pot 2 containing soil with KK (pan masala) & pot 3 contain (beedi). Same is done for mustard *Brassica juncea*. Later growth was observed after 7 days.
6. Qualitative test for carbohydrate and protein performed.
7. The absorption spectrum of plant pigment determined.
8. Protein estimated by folin’s Lowry method.
9. The later concentration of coffee on *Vigna radiate* L and cigarette, chewing tobacco on *Trigonellafoenum-graecum* & KK on mustard *Brassica juncea* is determined.

Table 1: Effect of Nicotine on growth of plants (Observation for *Trigonella foenum-graecum* (Day5-Day13))

Plant Name	Day 5 (Cm)	Day 7 (Cm)	Day 9 (Cm)	Day 11 (Cm)	Day 13 (Cm)
Trigonella Foenum-Graecum (Normal)	1.3 Cm	2.3 Cm	3.1 Cm	3.5 Cm	3.6 Cm
Trigonella Foenum-Graecum (Kk)	1.9 Cm	2.5 Cm	3.2 Cm	3.51 m	4.19 Cm
Trigonella Foenum-Graecum (Beedi)	2.05 Cm	2.95 Cm	3.3 Cm	4.4 Cm	4.56 Cm



Fig. 1: Day 1-Trigonella foenum-graecum (Normal , KK, BEEDI)



Fig. 2: Day 5



Fig. 3: Day 7



Fig. 4: Day 9-Trigonella foenum-graecum (normal), Trigonella foenum-graecum (KK),Trigonella foenum-graecum (beedi)



Fig. 5: Day 11



Fig. 6: Day 13

Table 2: Effect of Nicotine on growth of plants (Observation for *Trigonella foenum-graecum* (Day 1-Day 5))

Plant name	Day 1	Day 2	Day 3	Day 4	Day 5
Trigonella foenum-graecum (normal) (cm)	1.3	2.3	3.1	3.5	3.6
Trigonella foenum-graecum (Cigarette) (cm)	1.9	2.5	3.2	3.51	4.19
Trigonella foenum-graecum(Tobacco)(cm)	2.05	2.95	3.3	4.4	4.56



Fig. 7: Day 1-Day 5 Mustard *Brassica juncea* (normal), Mustard *Brassica juncea* (KK), Mustard *Brassica juncea* (beedi)

Table 3: Day 1-Day 5 Mustard *Brassica juncea* (normal), Mustard *Brassica juncea* (KK), Mustard *Brassica juncea* (beedi)

Plant name	Day1	Day 2	Day 3	Day 4	Day 5
Mustard <i>Brassica juncea</i> (normal)(cm)	0.18	0.68	1.36	2.26	3.4
Mustard <i>Brassica juncea</i> (KK)(cm)	0.33	1.23	1.8	2.28	3.4
Mustard <i>Brassica juncea</i> (beedi)(cm)	0.39	1.65	2.59	3	3.95



Fig. 8: Day 3



Fig. 9: Day 4



Fig. 10: Day 5

Table 4: *Vigna radiate* L. (Day 2-Day10)

Plant name	Day 2	Day 5	Day 10
<i>Vigna radiate</i> L.(Normal) (cm)	No growth	3.6	8.2
<i>Vigna radiate</i> L.(Coffee solution) (cm)	No growth	4.6	6.3
<i>Vigna radiate</i> L.(Caffeine bean solution)(cm)	No growth	2.0	3.8



Fig. 11: Day 10

The absorption spectrum of plant pigments

1. Grind properly the leaves bits with 80% acetone in a pestle and mortar.
2. Filter the extract with a funnel.
3. Add 30ml of petroleum ether and mix thoroughly, then add 35ml of distilled water.
4. All for separation in separating funnel.
5. The upper layer is petroleum ether containing the pigments. Discard the lower acetone-water level.
6. To the petroleum ether layer add 25ml of methanol and mix thoroughly. Allow separating in the separating funnel.
7. The petroleum ether fraction will contain the chlorophyll b and carotenoids. The methanol fraction will have the chlorophyll a and xanthophylls.
8. Collect the two fractions in two different beakers.
9. To the petroleum ether fraction add 30ml of KOH methanol and 15ml of water and mix thoroughly in the separating funnel. Collect the two layers. One is the chlorophyll b and other carotenoids.
10. To the methanol, layer add 25ml diethyl ether and 25ml distilled water. The xanthophyll and chlorophyll a layer separate. Collect it in two different beakers.
11. Observe the absorption spectra of the different fraction in the spectral photometer.

4. QUALITATIVE TEST FOR PROTEIN

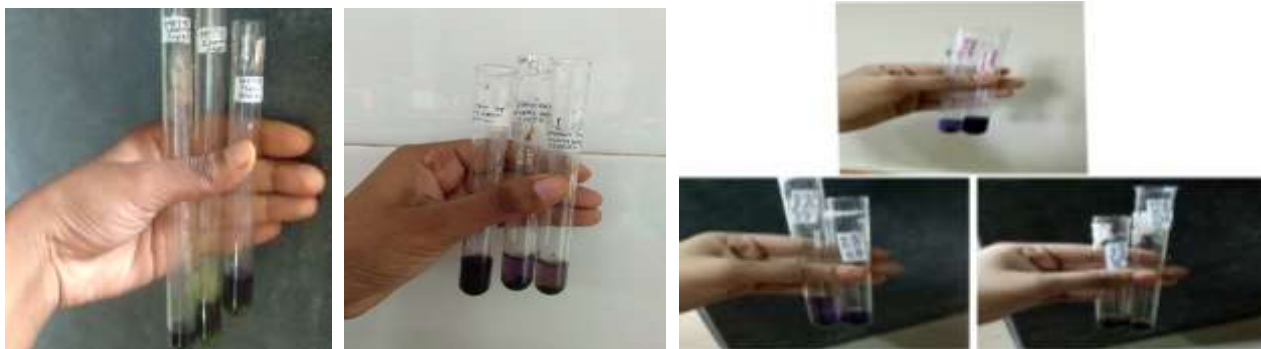


Fig. 12: Results for protein test

5. QUALITATIVE TEST FOR CARBOHYDRATES



Fig. 13: Results for carbohydrates test

6. ESTIMATION OF PROTEIN BY FOLIN METHOD



Fig. 14: Estimation of protein by Folin method Test results

7. EFFECT OF DIFFERENT CONCENTRATION OF KK BEEDI CIGARETTE



Fig. 15: Day 5



Fig. 16: Day 9



Fig 17: Brassica. nigra leaves, Presence of white spots on leaves on Brassica Nigra due to abiotic stress or fungal infection

Table 5: Protein estimation by Folin Lowry’s method

Tube	Protein Conc. (Microgram)	O.D. At 750 Nm
Blank	-	00
1.	0.2	0.10
2.	0.4	0.11
3.	0.6	0.12
4.	0.8	0.14
5.	1.0	0.16
Sample1B(Normal)	0.5	0.10
Sample2B(Kk)	0.35	0.07
Sample3b(Beedi)	0.25	0.05
Sample 1T (Normal)	1.34	0.27
Sample 2T (Kk)	0.45	0.09
Sample3T(Beedi)	0.8	0.16



Fig. 18: Test samples

Table 6: Absorption spectrum of plant pigments (*Trigonella foenum graecum*)

Plant Pigment	Normal (O.D)	KK (O.D)	BEEDI (O.D)
Chlorophyll a	0.61	0.09	0.05
Chlorophyll b	0.20	0.02	0.3
Carotenoids	0.21	0.15	0.10
Xanthophyll	0.29	0.17	0.11

Table 7: Absorption spectrum of plant pigments (*Brassica juncea*)

Plant Pigment	NORMAL (O.D)	KK (O.D)	BEEDI (O.D)
Chlorophyll A	0.96	0.4	0.30
Chlorophyll B	0.81	0.52	0.41
Carotenoids	0.23	0.21	0.12
Xanthophyll	0.49	0.16	0.19



Fig. 19: Test samples

8. RESULTS

Highest growth of *Vigna radiate* L. were observed in the pot which containing coffee solution than the normal pot Highest growth of *Trigonella foenum-graecum* were observed on the plant which containing cigarette then chewing tobacco and at last normal. Some Leaves of cigarette and tobacco containing pots shows white spots due to a phosphorous deficiency which may cause by cigarette and chewing tobacco.

A quantitative test for protein shows highest protein content on normal leaves then tobacco and cigarette. For a concentration of coffee, shows the highest growth at 5%-4% then 1% and then 3%, 2%. For cigarette and tobacco shows the highest growth on 3% then 2%, 1%, low amount of tobacco and least on the high amount of tobacco.

10. CONCLUSION

From this experiment, we can conclude that coffee solution (high conc. of caffeine) but at low amount makes mung bean plants grow the tallest, in comparison to water and caffeine bean solution. But also causing a negative impact on *Vigna radiate* L. they decrease their protein content as compared with normal *Vigna radiate* L plant by folin's Lowry method.

From cigarette, tobacco experiment we can conclude that cigarette and tobacco(low amount) significantly increase the plant growth as plant show highest growth and taller at 3%,2%, low amount of tobaccos compare with normal plant but there was significant decrease in germination rate or growth at pure tobacco or at high amount of tobacco. Also causing a negative impact on the plant as decreasing their protein content when compared with the normal plant by folin's Lowry method.

For cultivation of *Trigonella foenum-graecum* & *Brassica nigra*. Three pots were used for *Trigonella foenum-graecum* pot no.1 containing normal seeds, pot no.2 containing seeds with KK (Pan masala) & 3 no. seeds with Beedi. After a day to day observation, it showed that as compared to normal one the nicotine-containing *Trigonella foenum-graecum* shows the high length of root & shoot which may be due to hormone production. Abscisic Acid & cytokinin which is responsible for the root & shoot growth. For *Brassica nigra*, same was done it also showed the highest growth when Nicotine source KK (Pan masala) & Beedi were observed.

Since the nicotine has a drastic effect on root & shoot length which can be concluded as nicotine enhances the production of various hormones in the plant which in turn influences hormone production in the plant. So, in future, it can be used to increase the growth of plant whereas the nicotine shows the effect on nitrogen deficiency this can be overcome by adding nitrogen sources such as fertilizers or organic manure. For a concentration of nicotine on *Trigonella foenum-graecum* & *Brassica nigra*

For concentration, *Trigonella foenum-graecum* is used and nicotine source (Beedi) used. 1gm, 2gm & 3gm Beedi is used. Highest growth appeared on 3gm then 2gm and last on 1gm. For *Brassica nigra* nicotine source (KK) were used. 1gm, 2gm & 3 gm of KK used. Highest growth appears on 3gm then 1 gm & last on 2gm. So, we can conclude that nicotine enhances the hormones (Abscisic Acid & cytokinin).

Qualitative test for Carbohydrate performed by using Molisch which showed a positive result.
Qualitative test for Protein performed by using Ninhydrin which showed a positive result.

Protein is estimated by using Folin Lowry's Method since the deficiency of protein was detected as compared with normal which can be due to Nitrogen deficiency. The fungal infection may be creating hindrance in Nitrogen absorption of root and due to this protein content was found to be low.

The absorption spectrum of plant pigments were determined. It showed that highest chlorophyll a, chlorophyll b, carotenoids, xanthophyll were observed in the normal plant then the nicotine-containing plant. It may be due to decrease nitrogen content. Since nicotine effect on pigment content also which can be due to deficiency of Iron.

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