Honey as phytohormone and determination of the growth rate in *Nerium oleander* using different concentrations of honey.

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Abstract -The importance of this study is to show that honey is a natural phytohormone that is available can be used to increase the growth rate in the plants. The plant used for the study is *Nerium oleander*. Different concentrations of honey were prepared and cuttings of *Nerium oleander* were allowed to grow and subsequent growth rate was observed in the count of fifteen days and then thirty days. It was observed that at a particular concentration it promoted the growth of the roots and hence honey can be used a replacement to any chemical phytohormones. Root growth rate, density, and the total surface area affect the plant's stability to absorb the necessary compounds.

***Key Words*:**Honey, Phytohormone, Roots, Growth

1. INTRODUCTION

Plant hormones which are otherwise called as phytohormones are available in low concentrations which are signaling molecules produced by the plants (Paulus,E,H et al.,2012). They control all the growth and development in the plants. Honey has various nutritional and medicinal values, certain compounds present in the honey can act as a phytohormone and can be replace thechemical phytohormones (Peter,Neumann et al.,2010). The compounds present in the honey are responsible for increasing the growth of the roots. Honey is the by-product of flower nectar and is rich in phytohormones. Many nutrients are not easily accessible and it depends on the roots to directly contact them and uptake the nutrients, moisture and the minerals by the process of the osmosis (Andrew,B,Jull et al ., 2015). The process depends on the roots and the root hairs. Thus it is necessary to improve the quality of the roots to absorb the nutrients.

2. AIM

To prove that Honey is an effective natural phytohormone and is a natural rooting hormone with antiseptic and antibacterial properties and to calculate the length of the roots in different concentrations of honey and find out the ideal concentration where the root growth is maximum.

Table 1, Reported research regarding Honey as phytohormones

Year	Scientist Name	Title	Journal Name
2012	Paulus,H,S,Kwakman; Zaat,S,A	Antibacterial components of honey [1]	IUBMB Life
2010	Peter,Neumann; Carreck,N,L	Honey bee colony losses [2]	Journal of Apicultural Research
2006	Sarah,S,Greenleaf; Kremen,C	Wild bees enhance honey bees pollination of hybrid sunflower [4]	Proceedings of the National Academy of Sciences of United States
2015	Andrew,B,Jull; Cullum,N; Dumvike,J,C	Honey as topical treatment for wounds[7]	Cohrane Database of Systematic reviews
2008	Stefan,Bogdanov; Jurendic,T; Sieber,R	Honey for nutrition and health [6]	Journal of American College of Nutrition
2010	Dennis vanEngelsdorp; Meixner,M,D	A historical review of managed honey bee populations in Europe and the Unites States and the factors that may affect them[9]	Journal of Invertebrate Pathology
2003	Helena,Rybak	Honey [3]	Chemical and Functional properties of Food Saccharides.

2.1 MATERIALS AND METHODS

Collection of plant cuttings

The cuttings should be 6-12 inches in length and cut on about 45 degree angles.

Preparation of the cuttings

The explant is washed in soapy water and then placed under running water for 1 hour. Sodium hypochlorite is diluted and the final concentration of about 0.5 -1.0% is obtained and the cuttings are immersed in the solution for 15 minutes.

Treatment with Honey

Different concentrations of honey are taken and the plant cuttings are dipped in the concentrations and allowed to stay for 10 minutes and then transferred to the soil medium immediately to prevent any contamination (Helena, Rybak.,2003). The soil should be moist. In case of rooting in water, the plant cuttings should be placed immediately after the treatment in honey.

Preparation of different concentrations of honey

The honey of particular concentration is taken and mixed in the double distilled boiling water

Allowed to cool to room temperature and the mixture is stored in the airtight container to prevent any further microbial contamination (Stefan,Bogdanov et al.,2005).

It is stored in the dark area and away from sunlight.

2.2 OBSERVATION

The cuttings that were planted were observed after the interval of 15 days and 30 days. The length of the roots was measured.

Two sets of plants were taken.

Control 1- growth observed in 15 days is 2 cm and in 30 days it is 3 cm.

Control 2 – when treated with IBA (100 ppm) for 24 hours increased 7 cm in 15 days and 16 cm in 30 days

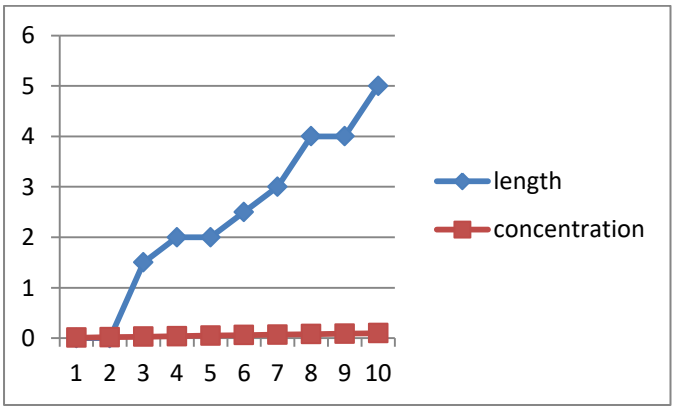
20% concentration of honey, in 15 days the length measured to be 2 cm and in 30 days no improvement was observed.

Table 2,Observed growth of the roots depending on the concentration

15 days	1%	2%	3%	4 %	5 %	6 %	7 %	8 %	9 %	10 %
Length measured	No growth	No growth	1.5 cm	2 cm	2 cm	2.5 cm	3 cm	4 cm	4 cm	5 cm
30 days	1%	2%	3%	4 %	5 %	6 %	7 %	8 %	9 %	10 %
Length measured	2 cm	3 cm	3.5cm	4 cm	5 cm	5 cm	5.5 cm	6 cm	6 cm	8 cm

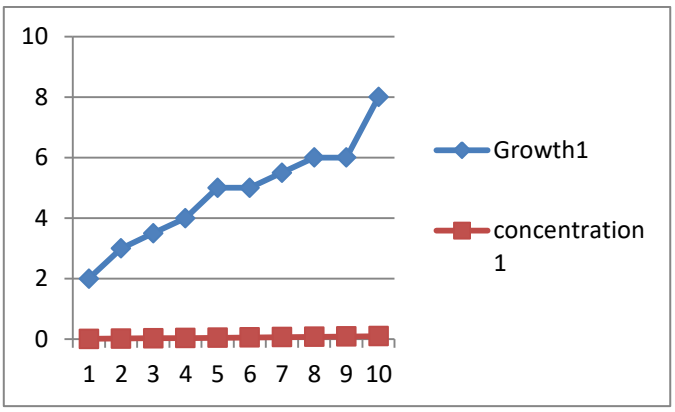
Charts

15 days



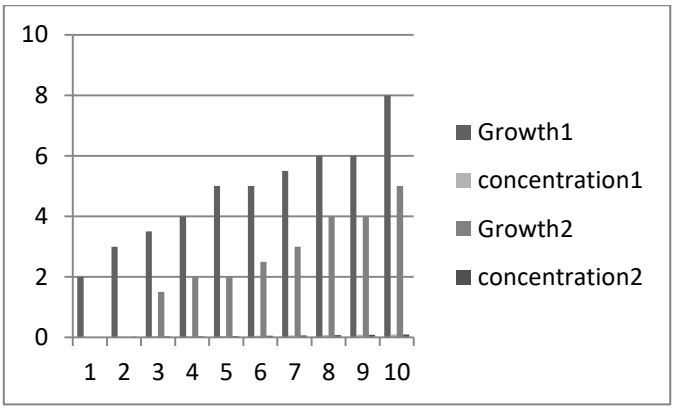
Graph 1, 15 days observation

30 days



Graph 2, 30 days observation

Comparison between 15 days and 30 days



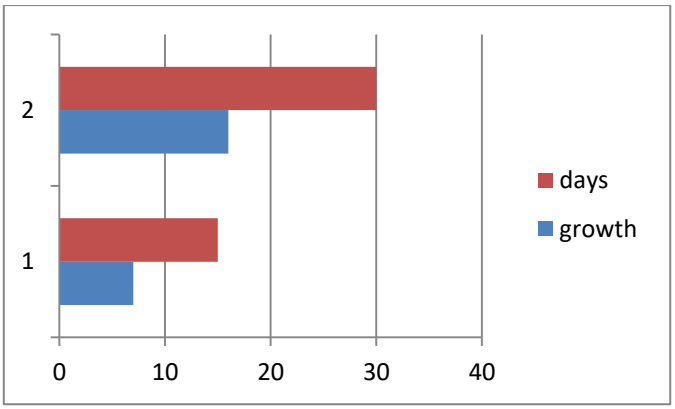
Graph 3, Comparison between 15 days and 30 days

Control 2 where IBA is used concentration is 100 ppm

Observation

15 days - 7 cm

30 days - 16 cm



Graph 4, Observation of growth using IBA between 15 and 30 days of interval

The plants treated with chemically synthesized auxins IBA of 100 ppm for 24 hours showed the maximum growth in short period of time but has low level oftoxicity, in caseof honey there is no toxicity detected. The human exposure to IBA results in potential risk. Honey is considered as safe and promotes root growth.

3. CONCLUSION

It was found out that the honey acts as a natural rooting hormone by improving the growth of the roots. The length of the roots increased depending on the concentration. At a specific concentration the length of the roots were measured to be maximum. Two sets of plants were grown , one set was grown for the observation of the length of the plants in the interval of 15 days where as the other set was grown for the observation of the length in the interval of 30 days. The 10% concentration of honey was found to be ideal and achieved the maximum growth compared to the other concentration. The plant which received 20 % concentration of honey had a poor growth rate so the ideal concentration for *Nerium oleander* was found out to be 10%. Although the root growth was efficient in theusage

of IBA than honey, honey is very natural and does not contain any ill effects compared to IBA.

DISCUSSION

The existence of 34 phytohormones is confirmed to be present in honey, which involves 14 cytokinins, 8 Gibberellins, 5 brassinosteroids, IAA , natural IBA, abscisic acid, salicylic acid, jasmonic acid and jasmonoyl leucine and jasmonyl phenylalanine. Apple cidar vinegar can be used as a weed killer. Honey had both antifungal and antiseptic properties thus prevent any microbial growth in the plants to some extent. Even though it results in the slow growth of the roots, it is considered as efficient and safe exposure to human. It is a very good replacement to chemically synthesized phytohormones. It is concluded that 5% Apple cidervinegar along with the 10% honey is found out to be used as phytohormone and weedicide. In this article, we found out the properties of a natural plant hormone and its specific concentration.

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