

# Effect of Kinetin on Enhancement of Tuberos Root Production of *Chlorophytum borivilianum*

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## ABSTRACT

*Chlorophytum borivilianum* Sant. et Fernand belong to family Liliaceae is a traditional medicinal plant of India. In the Mewar region of Rajasthan, locally it goes by the name of 'Safed Moosli'. The present study was undertaken to increase the production of costly medicinal component of the plant i.e. the tuberos roots using growth hormone kinetin following 100-300 ppm concentration. Both presampling and final experiments were carried out. Number of tuberos roots, freshweight of tuberos roots, weight of leaves and number of seeds produced per plant were the parameters taken into account to test the efficacy of kinetin. It can be concluded that 200 ppm of kinetin treatment resulted in enhancement of tuberos roots almost double (43.00 g) in comparison to controls (24.33g).

**Key Words :** *C. borivilianum*, leaves, tuberos roots, kinetin.

## INTRODUCTION

*Chlorophytum borivilianum* Sant. et Fernand. has been accepted presently and almost universally as a plant of exceptionally high medicinal value. (Thakur, Bhargava and Dixit, 2006<sup>1</sup>; Maiti and Geetha, 2005<sup>2</sup>; Tyagi and Sharma, 2002<sup>3</sup>; Tyagi, 2007<sup>4</sup>). The medicinal components of the plants are the underground tuberos roots. Though *Chlorophytum borivilianum* is presently described as a vitalizer for physical weakness, curative for natal and postnatal problems, as an aphrodisiac agent like the American Viagra, immunity improving drug and a remedy for diabetes and arthritis. The tribals of Mewar region have been using the tuberos roots and fresh leaves of this species to increase their sexual libido. Locally, it goes by the name "safed moosli". Not only the tuberos roots but even the fresh leaves are commonly eaten which are also aphrodisiac. Hence it is called as "Heritage Medicinal Plant". Tyagi (2007)<sup>4</sup> at present safed moosli is catching the imagination of medical specialists all over the world. The Medicinal Plant Board of India has recognized "safed moosli" as the sixth important herb to be protected and propagated. The Gujarat Govt. is already selling capsule of safed moosli under the brand name of Indian Viagra.

Though the effect of various growth regulators on seed germination and subsequent growth, especially breaking dormancy, promoting vegetative growth, initiating earliness in flowering in a large number of different species and vigour of grains right from the early work of Thimann and Koepfli (1935)<sup>5</sup> up to 1996 (Hopkins 1999<sup>6</sup>; Taiz and Zeiger 2006<sup>7</sup>) is well documented. A historical contribution

exposing the role of growth hormones was made by the great auxinologist Went wayback in 1920's (Went and Thimann, 1937)<sup>8</sup>. Based on the formative effect of auxins, several agricultural uses have now become available which enable Agricultural scientists to induce the desired pattern of growth of plants to achieve maximum productivity (Malik, 1995)<sup>9</sup>. However, a number of studies have already indicated that different species of plant respond variously to different regulators in respect of growth. However, there has been hardly any work on productivity of tuberos roots especially that of *C. borivilianum vis-a-vis* effect of growth hormones.

Therefore the present study aimed to achieve higher production of costly medicinal component of *C. borivilianum* that is the tuberos roots using growth hormone kinetin as the enhancement factor.

## MATERIALS AND METHODS

The Plant *Chlorophytum borivilianum* was treated will different concentrations of kinetin for optimum production of tuberos roots of *C. borivilianum*.

### Experimental Design :

**Presampling experiments to establish the favourable range of concentrations and duration for maximum production of the tuberos roots :**

In the presampling experiments 2-5 propagules were grown in a pot 40 cms in height, 30 cms top diameter and 20 cms with bottom diameter. Presampling with the following treatments was done by soaking the root propagules in various concentrations of Kinetin and potassium salts for a period of 48 hours as per the following schedule.

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**Table 1 : *Chlorophytum borivilianum* showing the effect of certain concentration of KINETIN on the production of tuberous roots/leaves/seed**

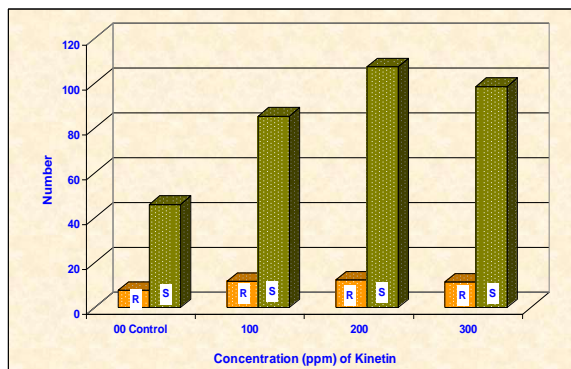
Concentration (ppm)	Replicates	A Number of tubers/plant	B Fresh weight of tubers/plants	C Fresh weight of leaves/plant	D Number of Seeds/Plant
OO Control	r1	8	11	22	51
	r2	7	9	25	47
	r3	8	12	26	40
Mean		7.666	10.666	24.333	46.00
100	r1	11	13	30	89
	r2	13	15	33	87
	r3	11	13	30	80
Mean		11.666	13.666	31.00	85.333
200	r1	12	24	42	110
	r2	13	27	46	105
	r3	12	23	41	107
Mean		12.333	24.666	43.000	107.333
300	r1	11	20	36	99
	r2	12	17	39	96
	r3	11	19	32	101
Mean		11.333	18.666	35.666	98.666

The Kinetin concentration was varied from 25,50,100,200,300 to 500 ppm.

Favorable range of kinetin concentration from the above presampling experiments in the range of 100 to 300 ppm was obtained.

**Final Treatments, Based on Guidelines Provided by Results of Presampling Experiments:**

In the following treatments propagule tubers were dipped in various solutions for a period of 48 hrs after which they were taken out and spread on a blotting paper to remove the adhering solution. After this, the propagules were inserted in the soil in such a manner that about 6 cms of the soil covered the top of the propagules. In all treatments, including controls, five tuberous roots were buried in the soil in this way but the final data were recorded



**Figure 1: Showing the Effect of Kinetin on the number of Tuberous Roots (R) and Seeds (S) per Plant**

Graphic representation of the effect of pretreatment of *Chlorophytum borivilianum* root propagules with different concentrations (ppm) of Kinetin on the number of tuberous roots (R) and seeds (S) per plant.

in respect of only three randomly chosen replicates. Thus, the final data for only three replicates were tabulated. Relevant statistical analysis were got done with the help of a Computer Statistician in respect of the following parameters:

A: Treatment *versus* number of tuberous roots per plant

B: Treatment *versus* number of freshweight of tuberous roots per plant.

C: Treatment *versus* weight of fresh leaves per plant.

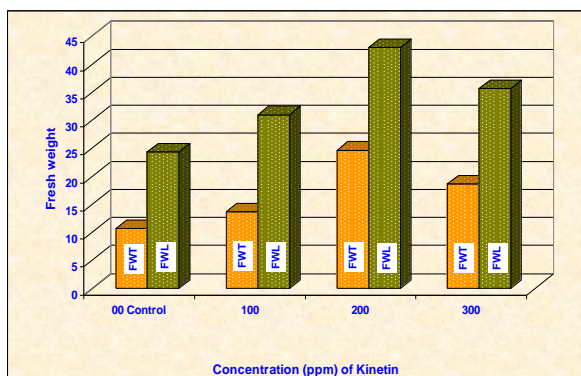
D: Treatment *versus* number of seeds produced per plant.

## RESULT

The present work which was planned with the sole object of increasing commercial production of "Safed moosli", tuberous roots of *Chlorophytum borivilianum* which constitute the medicinal component of the plant. Kinetin has a spectacular effect in respect of higher production on all the four parameters studied (Figure 1 and 2; in comparison to the controls, the treatment under 200 ppm of kinetin were highly significant rather than 100 & 300 ppm in respect of freshweight of root which was 24.666 gm whereas that from control was only 10.666 gm that is about two and a half times superior than the control).

## DISCUSSION

The tuberous roots of *Chlorophytum borivilianum* are known as *Safed moosli*. In the tribal region of Mewar these have been used traditionally as a cure



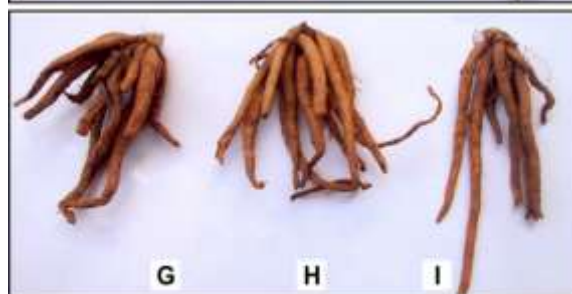
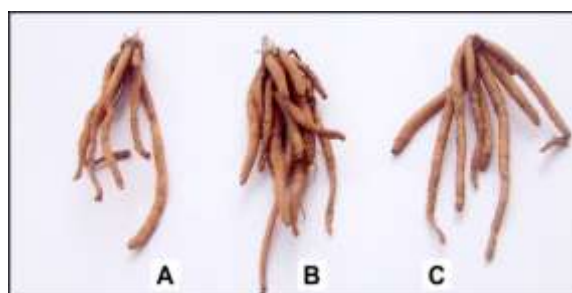
**Figure 2: Showing the Effect of Kinetin on the Fresh weight roots (FWR) and leaves (FWL) per Plant**

Graphic representation of fresh weight of tuberos roots (FWR) and leaves (FWL) per plant subsequent to pretreatment of *Chlorophytum borivillianum* root propagules in different concentrations (ppm) of kinetin.

against erectile dysfunction and constitute its medicinal component. However, there is hardly any work on the production of root, stem, leaves or seeds of *Chlorophytum borivillianum*. Once its properties as a cure against erectile dysfunction was established, it has been almost eradicated from its natural habitats and is now mainly dependent on *ex-situ* cultivation for commercial production. The discovery of cytokinin was made by researchers who were trying to search chemicals which stimulate cell division in plants. It was Miller *et al.* (1955)<sup>10</sup> who discovered kinetin as a breakdown product of DNA and as adenine (A-amino-purine) derivative that is 6-furfuryl aminopurine. It was also reported that kinetin in the presence of auxin promoted cell division of tobacco pith parenchyma cells in culture and that no cell division occurred in the culture medium in the absence of auxin showing clearly that these two growth regulators together promote cell-division. Kaur (1980)<sup>11</sup> reported that soaking of wheat seeds in 10 ppm of solution of kinetin before sowing improved the emergence percentage of seedlings and number of grains per year, average weight of the grain and the dry biomass of the shoot per plant. Also there was a increase in root length and chlorophyll content and fresh leaves and organic matter production. Singh *et al.* (1984)<sup>12</sup> showed that spraying of rice plants by 10 ppm of solution of kinetin led to an increase in the number of grains per panicle, average weight of the grain and thus the overall yield of rice. Then, there are a few more authors (Bachelard and Stowe, 1963<sup>13</sup>, Meredith *et al.* 1970<sup>14</sup>) who have reported favourable effects on rooting by kinetin. Sharma (1993)<sup>15</sup> reported the same in *Commiphora wightii* and *C. agalocha* and Ahuja in the bitter variety of *Tinospora cordifolia*. Thus influence of kinetin is not universal but rather



**Photo plate: Production of tuberos roots control (A-C)**



**Photo plate: Production of tuberos roots under various concentration of kinetin**

A-C :Under 100 ppm of kinetin – Three replicates

D-F:Under 200 ppm of kinetin – Three replicates

G-I:Under 300 ppm of kinetin – Three replicates

variable from species to species. Ahuja (2000)<sup>16</sup> also reported that certain concentrations of kinetin did lead to an increase of fresh biomass in both the (bitter and non-bitter) variety of *Tinospora cordifolia*. In the present work, presoaking of root propagules of *Chlorophytum borivillianum*, the fresh weight increased in all concentration tried in comparison to the control. Interestingly under (Table 1 and Plate-D to F), 200 ppm concentration of

kinetin, the freshweight of the roots was almost double (43.00 g) in comparison to the control plate A-C(24.33 g) which can lead to the traders.

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#### REFERENCES

- 1 Thakur, M., S. Bhargava and V.K. Dixit, 2006. Immunomodulatory activity of *Chlorophytum borivillianum* Sant. et. Fernand. CAM 1-5, doi : 10.1093/ecam/nel1094.
- 2 Maiti, S. and K.A. Geetha, 2005. Characterization, genetic improvement and cultivation of *Chlorophytum borivillianum* - an important medicinal plant of India. Plant Genetic Resources 3 : 264-272.
- 3 Tyagi, S. and V. Sharma, 2002. Effect of urea and theourea on the production of tuberous roots in *Chlorophytum borivillianum* Sant. et. Fernand. Environ. Biol. Conser. 7: 41-44.
- 4 Tyagi, S., 2007. Experimental studies for augmented production of tuberous roots in *safed moosli* (*Chlorophytum borivillianum* Sant. et Fernand) – A heritage medicinal plant specus of the tribal peopa of Mewar region of Rajasthan. Ind. J. Environ. Sci. 11: 123-127.
- 5 Thimann, K.V. and J.B. Koepfli, 1935. Identity of the growth promoting and root forming substances of plants. Nature 135: 101-102.
- 6 Hopkins, W.G., 1999. Introduction to Plant Physiology. John Wiley & Sons, Inc. NY.
- 7 Taiz, L. and E. Zeiger, 2006. Plant Physiology, Sinauer, Associates, Inc., Publishers, Sunderland, Massachusetts.
- 8 Went, F.W. and K.V. Thimann, 1937. Phytohormones. The MacMillan Company, NY.
- 9 Malik, C.P., 1995. Plant growth regulators : Software for plant development and crop productivity. Presid. address, 82<sup>nd</sup> Ind. Sci. Congr. Assoc., Botany Section, pp. 1-34.
- 10 Miller, C.O., F. Skoog, M.H. Von Saltza and F. Strong, 1955. Kinetin, a cell division factor from deoxyribonucleic acid. J. Am. Chem. Soc. 77: 1392-1393.
- 11 Kaur, P., 1980. Effect of CCC and kinetin on the physiology of wheat under different salinity levels. MSc Thesis, Punjab Agric. Univ., Ludhiana.
- 12 Singh, G., 1984. Effects of dates of sowing and growth regulators on growth and yield of mung. M.Sc. Thesis, Punjab Agric. Univ. Ludhiana.
- 13 Bachelard, E.P. and B.B. Stowe, 1963. Rooting of cuttings of *Acer rubrum* L. and *Eucalyptus camaldulensis* Deyn. Aust. J. Bioi. Sci 16:751-767.
- 14 Meredith, W.C., J.N. Joiner and R.H. Biggs, 1970. Influence of indole 3-acetic acid and kinetin on rooting and indole metabolism of *Feijoa sellowiana* : J. Amer. Soc. Hort. Sci. 95 : 49-52.
- 15 Sharma, R., 1993. Reproductive biology of Guggal plant. *Commiphora wightii* (Arnott.) Bhandari and *Commiphora agalocha*, Ph.D. Thesis, University of Rajasthan, Jaipur.
- 16 Ahuja, K., 2000. Studies on Phenotypic Variation. Clonal Propagation and Phytochemistry of *Tinospora cordifolia* (Willd.) Ex Hoof. f. et. Thomas. Ph.D. Thesis, Univ. Rajasthan, Jaipur.