



Research Paper

Agnihotra Homa and its Effect on Plants Possible Role of Phytohormone Brassinolide

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ABSTRACT

All important functions pertaining to growth and development of plants are regulated by phytohormones. When I happened to follow a Vedic procedure known as Agnihotra Homa in a field and at my home it was observed that the effects of agnihotra vapour on plants in its vicinity were very much similar to that are now being ascribed to the hormone Brassinolide, a brassinosteroid having a structure very similar to animal steroidal hormone. Agnihotra uses oblation of whole rice grains smeared with cow ghee (clarified butter) into the fire created by cow dung cakes which have also been smeared by cow ghee. The oblations are offered at the exact time of sunrise and sunset. Due to this special fire, certain substances get vaporized which come out as the white smoke. It was observed that the bio-energies produced by the Agnihotra were responsible for characteristic changes in the plant morphology, architecture and phases of growth development like initiation of new growth, flowering and fruit development. The effects were found to be more pronounced in presence of **sunlight**. It is interesting to note that synthetic brassinosteroids are now used commercially on a large scale to bring about such changes in the crops.

KEYWORDS: brassinosteroids, phytohormone, agnihotra, agnihotra vapour, plant growth regulators.

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I. INTRODUCTION

Phytohormones or the plant hormones are naturally occurring small organic molecules or substances which influence physiological functioning of plants. Auxins, Gibberlins, cytokinins, IAA are some of the important plant regulators. Brassinolide a plant hormone a member of brassinosteroids (Brs), a new class of plant hormones was added to the class of plant hormones quite late around 40 years ago.¹ Research has now helped us to achieve a good deal of understanding with regards to their production and functions. Yet it is intriguing to note the pleiotropic effects of Brs, Brs have been shown to be responsible for diverse physiological functioning of the plants, through their growth and differentiation. Brassinosteroids nearly comprise 70 polyhydroxylated sterol derivatives. Another interesting feature of these BRs is that they are structurally more similar to animal steroidal hormones than the other plant hormones. Brassinosteroids have a wide occurrence in plants and have now been reported to occur at low levels in pollen, anthers, seeds, leaves, stems, roots, flowers and growing young dividing vegetative tissues throughout the plant kingdom.² Since these were first discovered in Brassica pollen these are known as brassinolide.³ These growth-promoting steroids, were found to regulate height, fertility, and seed-filling in crop plants such as rice (*Oryza sativa*) and also induce stress, and disease resistance in green algae and angiosperms.⁴

Functions

For years BRs were not considered true plant hormones. The turning point in BR research was the discovery of the Arabidopsis dwarf mutants det2 and cpd in 1996. These BR-deficient mutants were found to revert to the wild-type phenotype following BR treatment. It was then found out that at the cellular level, BRs control cell elongation division, and differentiation. At the whole-plant level, BRs control several traits of agronomic importance such as seed germination, plant architecture, senescence, flowering time, seed yield, and tolerance to various abiotic and biotic stresses.⁵

Practical Application

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Only after 20 years of their discovery brassinolide, the first member of the brassinosteroid series, was not only artificially synthesized but also its application for agriculture was becoming evident⁶. Similarly its potential was also used in horticulture and its role in early fruit development was reported.⁷ Slowly role of brassinosteroids was gaining importance in tissue culture too with reports coming from different parts of the world.⁸

Stress Resistance

The hormone has also been found to increase photosynthesis and confer salt resistance in rice seedlings.⁹ An important review article described brassinosteroids to hold a great promise for 'green biotech-revolution', for the generation of disease-resistant high-quality crops.¹⁰

Interaction with other hormones

BRs potential to increase resistance in plants to a wide spectrum of stresses, such as low and high temperatures, drought, high salt, and pathogen attack and studies on the BR signaling pathway and BR indicate that there is cross-talk between BRs and other hormones. BRs interact with other phytohormones such as auxin, cytokinin, ethylene, gibberellin, jasmonic acid, abscisic acid, salicylic acid and polyamine in regulating wide range of physiological and developmental processes in plants, and inputs from these studies are now being linked to the versatile roles of BRs.¹¹ Important mechanism of homeostasis is also linked to brassinolide and the cross talk.¹² A study has confirmed that Brassinolide treated segments contained a slightly higher level of IAA than water-treated segments.¹³ Some results have indicated that BL interacts negatively with IAA in the regulation of plant gravitropic response and root growth, and its regulation is achieved partly by modulating biosynthetic pathways of the counterpart hormone.¹⁴

Brs in nut shell:

1. Promotion of cell expansion and cell elongation; works with auxin to do so.
2. It has an unclear role in cell division and cell wall regeneration.
3. Promotion of vascular differentiation; BR signal transduction has been studied during vascular differentiation.
4. Is necessary for pollen elongation for pollen tube formation.
5. Acceleration of senescence in dying tissue cultured cells; delayed senescence in BR mutants supports that this action may be biologically relevant.¹⁵

What is Agnihotra?

Agni means fire and **hotra** means an offering or an oblation, Agnihotra means the act of offering or an oblation into the fire. India has a great tradition of Yagnyas, they are the very essence of **Vedic Science**. Yagnyas were basically performed by the Vedic people to remove the toxic substances from the environment through the agency of **fire**. Scientific principle behind it was that 'When you heal the atmosphere the atmosphere heals you'.¹⁶

There were many types of Yagnyas and many different types of Medicinal herbs were used in Agnihotra to produce the volatile substances. I have listed some of these Yagnyas in my earlier paper along with the kind of energies these Yagnyas produce. The article also highlights important properties of the materials and the kind of energies they could produce for daily agnihotra homa that I followed.¹⁷

The Vedic of procedure of Agnihotra where two oblations with rice are offered into the specially lit fire made with cow dung cakes smeared with cow ghee was **revived in 1969**, by Param Sadguru Shri **Gajanan Maharaj** of Akkalkot, Maharashtra State, India (1918 - 1987).¹⁸ Fondly known as 'Shree', Gajanan Maharaj had initiated his disciples Vasant Rao Paranjpe and MG Potdar, in his spiritual path. Mr Potdar propagated Agnihotra message in India and abroad right from 1963 to 1974 i.e. till his death. On orders from the Sadguru, Paranjpe went to Peru in 1972 to spread Agnihotra over there. Peru now has huge Agnihotra farms where it has profoundly benefited agriculture.¹⁹ Agnihotra has also been shown to offer following agricultural benefits:

- A. Hastening of seed germination²⁰
- B. Protection against insects
- C. Overall improvement in Plant Growth²¹
- D. Increased yield²²

Agnihotra and Homa Farming

Talking about agriculture I would like to mention agricultural farms which use homa farming methods to improve the yield and the disease resistance of the crops. Homa farming methods use agnihotra a vedic procedure for betterment of their farms. A number of countries are following this homa farming methods.²³

Objective of present study

I was following this ancient vedic procedure (agnihotra homa) for mental peace and wellbeing and only by chance came to notice the curious effects that it had on plants kept on my terrace where the procedure was performed. After that I repeated the procedure in open fields and on my terrace many times and studied the effects and published it to highlight the possible link between Agnihotra and the phytohormones.²² The aim of this study is again to reestablish the link between the ancient Vedic procedure a holistic system that took care of plant growth through the agency of the plant growth regulators brassinosteroids.

II. MATERIALS AND METHODS

How to perform Agnihotra?



Figure 1: Agnihotra Inverted Pyramidal Copper Vessel

As a Vedic procedure, that I followed, Agnihotra fire was provided with following inputs:

1. A specific organic substance (unbroken rice grains known as Akshat)
2. Inverted copper pyramid (Fig 1)
3. Cow ghee or the clarified butter
4. Cow dung cakes
5. Camphor to ignite the fire
6. Agnihotra (fire sacrifice of rice grains) at exact timings of Sunrise and Sunset
7. Inputs in the form of short Sanskrit mantras at the time of oblation.

The fire is lit in a pyramid shaped copper vessel of specific dimensions (Base 5.25cm*5.25cm; Area at the open end:

14.5cm*14.5 cm and height: 6.5 cm).

Cow dung cakes are arranged in the vessel along the 4 sides in a way so as to allow for free passage of air. Cow ghee is applied at the lower surfaces of the cow dung cakes, whereas it is applied on the upper side of cow-dung cake to be placed in the centre. A triangular cow-dung cake piece on which ghee is applied on both sides is put above the central piece. Fire in my studies was lit with the help of camphor. A smoke-less fire should be ready before the Ahuti (offering) is made at the exact sunrise and sunset timings. At exact sunrise and sunset time, unbroken rice grains smeared with little cow ghee are put in the fire as an oblation along with chanting of specific Mantras. These Mantras have specific effect on the mind of the performer.

Chant at Sunrise

“Suryay Swaha, Suryay Idam Na Mama” “Prajapataye Swaha, Prajapataye Idam Na Mama”

Chant at Sunset

“Agnaya Swaha, Agnaya Idam Na Mama” “Prajapataye Swaha, Prajapataye Idam Na Mama”

III. RESULTS

The following effects were observed in plants in agnihotra atmosphere:

1. Breaking the seed dormancy and enhancing its germination

It was observed that whenever agnihotra was performed, new seedling started to appear from the soil in different pots from the dormant seeds. (Fig 2A, B, C) The agnihotra vapour was somehow entering the soil and was inducing the seed growth. The growth of the seedling was very fast and the stalk was very flimsy due to fast *cell elongation*. The same kind of effect of agnihotra vapour was observed on freshly sown seeds in a pot which was kept at a height. (Fig 2 D)



Figure 2A



Figure 2 B



Figure 2D

Figure 2 A, B, C: Initiation of new growth from the dormant seeds in pots ,
Figure 2 D: Hastening of seed germination

2. Proliferation of Leaves

Most plants kept on the terrace had increased leaf production including Crotons and number of other ornamental plants. (*Fig 3A*) That time croton was receiving direct sunlight and the effect of agnighota on was very much evident and leaf proliferation was at its peak. (*Fig 3B*) In the field also increased leaf production was observed most of the plants. The mango tree which was outside the terrace facing it and was receiving direct sunlight also had tremendously increased leaf proliferation. The leaves of mango plants due to excessive growth were drooping as seen in the picture. (*Fig 3C*) Later on these became same as older leaves.

Figure 3 A





Figure 3B



Figure 3C

Figure 3 A, B, C: Increased Leaf Formation

3. Promotion of Axillary Buds

It was my curious observation that agnihotra had promoted the formation of side growths as against apical meristem. (*Fig 4B*) Tulsi plant reduced to dry wood had formation of leaves in it after exposure to agnihotra vapour which were formed at the base. (*Fig 4 A*) Generally I was performing Agnihotra on my terrace, but for 3-4 days I performed it in my room where there was a window looking at the same mango tree which faced my terrace. As is evident many axillary buds became active on exposure. (*Fig 4 C*)



Figure 4A



Figure 4B



Figure 4C

Figure 4 A, B, C: Promotion of axillary meristem

4. Formation of a branch at the base and cell elongation

Figure 5 A, B, C: Promotion of a new branch at the base in different rose plants

Figure 5 D: Formation of new branch at the base in a flowering plant

The newly formed shoots in all rose plants that I observed were red in colour and grew very tall.(Fig5ABC) Look at the (Fig 5D)here also the newly produced branch was produced at the base and was growing very fast due to increased cell elongation and was geotropic, but later on started growing upwards. However one thing is clear that the effects are seen first at the base in flowering plants which points towards growth regulator substance first accumulating at the base.

5. Induction of Flowering

Induction of flowering was seen as the main effect of Agnihotra, and has been reported in my previous reports in great details. ²³In the field, most of the plants responded by flowering in presence of Agnihotra. A lemon tree which had lemons growing on it also produced flowers. In some of the plants kept on my terrace it induced the production of inflorescence but before that all the leaves were shed after yellowing and curling. (Fig 9 B)After the inflorescence was formed the leaves started appearing at the base. (Fig 4A) Rose plants which were getting sunlight responded by tremendous increase in number of flowers. The mango tree facing my terrace every year had formed very few flowers and that too were later blown away by the wind or rain. However after exposure to agnihotra vapour it formed flowers in huge numbers. (Fig 6A)

6. Formation of Fruits

It was observed that mango plant facing my terrace did not bear any fruit till the agnihotra was performed. Flowering was there but very less and those flowers when turned into fruits, were shed at the stage when it was very small. But exposure to agnihotra vapour had not only caused increased flowering (Fig 6A) but also the formation of fruit in large numbers. Look at the pictures (Fig 6 B C) in both cases the mangoes were formed due to exposure to agnihotra vapour.

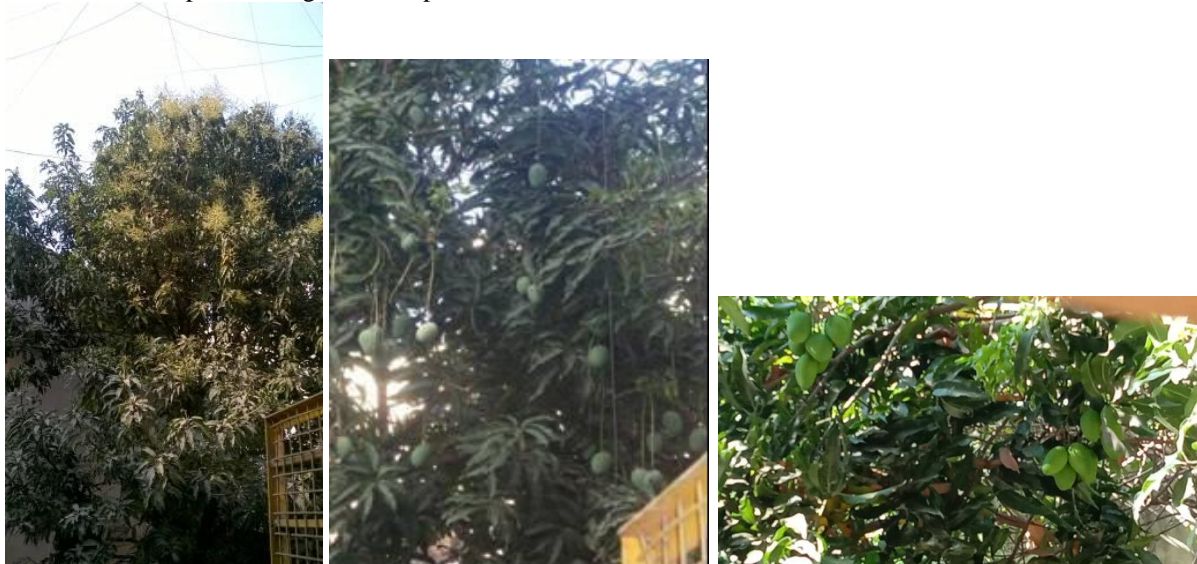


Figure 6A Flowering
Figure 6

Figure 6B, 6C Fruit Formation

Mangoes in the earlier picture are having characteristically long stalks. One reason here could be that agnihotra that time was performed with polished white rice (2006) and this time it was performed with brown rice (2020). In the recent incidence very few flowers were seen on the tree but there was seen quite a lot of fruit production on the tree, but the fruit architecture was very different.

7 Change in plant architecture, tropic curvature

Mostly a money plant grows upwards, but after exposure it was seen the branches of money plant grew horizontally, as was seen with some of the flowering plants also. (Fig 7) See the (Fig 8A) here in the monsoon season there were seen *root premordia* due to presence of moisture, and because of these root premordia the shoot was becoming geotropic. You can also appreciate great change in the morphology of Mangoes formed when agnihotra was performed in January and when in the month of March. (Fig 6B &C)



Figure 7: A

shoot growing horizontally uphold by leaves

8 Stimulation of root growth

As discussed earlier Brassino-steroids are natural plant hormones critical for growth and development of most of the plant organs. Brassinosteroid deficient mutants have been shown to have significantly short roots. But after treatment with synthetic brassino-steroids they had formed roots. Look at the root premordia(Fig 8A)



Figure 8 A, B Formation of Root Premordia Figure 8B Formation of long roots

It is curious to note that when agnihotra was performed in rainy season; very long roots were formed from these root premordia which were otherwise absent in most of the money plants.(Fig 8 B) In absence of moisture new leaves are formed but in presence of moisture characteristically long roots possibly with the interaction of plant hormones auxin was formed.

9 Senescence

In my earlier agnihotra procedures when I was using polished rice and yellowing of leaves was seen invariably associated with new growth in money plant. (Fig 9A). And in flowering plants shedding of leaves or wilting of the leaves was observed before the inflorescence was produced. (Fig 9B)



Figure 9 A



Figure 9B



Figure 9 C

Figure 9 :Incidence of Senescence in Agnihotra Atmosphere

In mango plant facing my terrace yellowing of leaves were significantly observed where new leaves were formed in areas which were getting less sunlight.

IV. DISCUSSION:

After observing results it becomes clear that effects of agnihotra vapour are dependent on various factors like temperature, sunlight, the time span for which agnihotra is performed and the month when agnihotra is performed. When the agnihotra was performed with white(polished) rice some of the effects like cell elongation, yellowing of the leaves along with the appearance of new growth were more pronounced. It is clear

from the discussion of the results that the agnihotra vapour is somehow stimulating the production of brassinosteroid hormone in plants. Yellowing, formation of roots, cell elongation etc effects suggest that the interaction of hormones like Auxin, IAA, cytokinin etc. The possibility of vapour carrying steroidal precursors of the phytohormone cannot be denied. It has been proved by the research that receptors for the hormone and its steroidal precursors are present on the surface which is also proved by the results in the case of agnihotra vapour. As you see some of the effects like cell elongation quite pronounced with white rice as against the brown rice. Cell elongation is the main effect of gibberellins. Research has also provided the evidence cross talk between different growth regulators.

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