

Agnihotra (The Everyday Homa) & Production of Brassinosteroids: A Scientific Validation

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Abstract

Agnihotra, homa has significant effect on plant growth and development. Homa farming methods are used in different parts of the world to increase the yield and disease resistance of produce. The effects on plants produced by the vapour of homa performed at the exact time of sunrise and sunset are almost similar to the plant hormone brassinolide. The paper discusses the possibility of phytosteroid precursors or brassinosteroids being produced or triggered in the exposed plant through volatile substances or fumes generated by the agniotra fire.

Key words

Agnihotra, Homa farming, Brassinolide, Brassinosteroids, Phytohormones, Phytosteroids, Plant growth

I. INTRODUCTION TO YAGYAS

YAGYA (YAJÑĀ) in general and Agnihotra in particular, have now opened new horizons for researchers around the world. A yagya is a sacrificial rite or performance of duty which should be offered with devotion, without any desire for personal gain, and with a firm belief in its rightness. [1] The systematic study of **Vedic Yagyas (Sacrificial Rites)** by various scientific and spiritual communities has not only reaffirmed our belief in the ancient Vedic wisdom, but has also provided a 'system' or an anecdote to combat almost all problems of the modern life. [2] On one hand, a Yagya serves to purify the environment, and on the other, it blesses the person performing it by helping in the proper alignment of his body, mind and the soul.

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. Yagyas, as some might believe, are not mere Vedic **Rites** and **Rituals**, they are the very essence of **Vedic Science**. Yagyas were basically performed by the Vedic people to remove the toxic substances from the environment through the agency of **fire**. The scientific principle behind it was that 'When you heal the atmosphere the atmosphere heals you'.

Thus, the Vedic culture had evolved on the basis of Yajñās having primarily the purpose of creating harmony in the society and its environment. And on the spiritual level, the yagyas provided a link or a bridge between the humans and the **Gods** or the **cosmic forces**. Yagyas provided a means to satisfy devas or gods which in turn fulfilled the needs and desire of people performing it. The same philosophy of 'yagya' has been very beautifully explained in Bhagvad Geeta. [3]. In modern times too it is our moral duty to perform yagyas or do agnihotra daily for the immense benefits that it offers to the living world as well as to abiotic environment around us

Fumigation

Medicinal smoke produced by the burning natural substances was used in ancient India to purify the environment. Vrukshayurveda describes in its 53 verses the various plants which were used for fumigation purposes alone or along with yagyas. [4] It enlists about 32 different plant materials which were supposed to be inhaled for illness of various body parts of humans and animals.

A scientific validation of the above fact was done by this study on airborne bacterial composition and dynamics, using the Biolog microplate panels and Microlog database. It was observed that medicinal smoke emanated by burning wood and a mixture of odoriferous and medicinal herbs (havan sámagri or samidha material used in

oblation to fire all over India) caused over 94% reduction in aerial bacterial counts by 60 min exposure. It was observed that the ability of the smoke to purify or disinfect the air and to make the environment cleaner was maintained up to 24h in the closed room. Absence of many pathogenic bacteria even after 30 days was indicative of the bactericidal potential of the medicinal smoke treatment. [5]

In another study **Biofumigation** was carried out by burning the mixture of selected plant with **fumigation catalyst viz ghee and cow dung cakes**. Various holy sticks (dhoop) made from different trees were obtained and fumes were produced along with cow dung cake and ghee. Various bacteria isolated from different sources were exposed to different stick fumes(dhoop). It was found that fumes of *Achyranthus aspera* controlled the bacterium *Streptococcus pyogenes*. *Azadirachta indic*; *Calotropis gigantea* ; *Ficus benghalensis* ; *Ficus religiosa* ; *Mangifera indica*; and *Pongamia pinnata* were also found to be effective in controlling pathogenic bacteria.[6]

II. VASTU SHANTI HOMAS

Vastu Shanti or Griha Shanti (House Warming in India) also involves the Havan or the Vastu Homa. A Homa is a Sanskrit word which means a small Yajna typically performed at home, as opposed to the elaborate Yagnas done in public which could last for many hours. A havan is the synonym of homa which is performed to create a peaceful environment in the new space and to keep away all the negative forces and to prevent harmful influences of the planets. This is done with drawing a Mandala to invoke the God and the nine planets, which act as witnesses to the ceremony. The next ritual is oblation to the Havan. Camphor, sesame, grain and fuel sticks, along with other ingredients are offered to fire or Agni supposedly conveys them to the gods.

Vastu Homas are basically performed to purify the immediate environment for the occupants. Scientific studies conducted have shown that due to vastu Homa, considerable reduction in bacterial and fungal counts was observed. Triplicate observations indicated that reduction in fungal count from 70.33% to 51.6% was noted in one home and similarly from 87.91% to 48.33% in second in third from 80% to 30.62% was registered. Vastu Homas are performed in new buildings. [7] But the report also says that Agnihotra performed daily had registered many more advantages.

III. INTRODUCTION TO AGNIHOTRA HOMA

The great saints of Saraswati Indus civilization (approx. 9500 years ago) performed Agnihotra yajna (fire offering) in order to purify the environment, as detailed in Rigveda (oldest of Vedas). [8] In this yajna certain natural elements were offered to the fire that was lit in an inverted copper pyramid which was accompanied by the chanting of specific mantras. The Ayurvedic literature also describes a system of therapy and which is known as Agnihotra Chikitsa. [9] Here, Agnihotra has been described as a process during which pyre is lit in a pyramid shaped pot with the help of **cow dung**, in which twig of some plants are added along with **clarified butter**. Pinch of **rice** is offered in flame during sunrise and sunset.

Scientific studies have also been conducted for some of the medicinal plants used as samidha in Agnihotra. The plant extracts were studied for their chemical analysis and methods like Atomic Absorption Spectroscopy (AAS) and Flame Photometry were used for assessment of their mineral content so that it could be traced to their ash content. [10] It is important to note here that the fumes produced by the samidha as well as the ash produced by these plants had been shown to be beneficial for the living world.

An important study on effect of Agnihotra fumes on aeromicroflora needs special mention here. The Agnihotra hawana was carried out by using Palasa (*Butea monosperma*), Pimpal (*Ficus religiosa*), Udumbara (*Ficus racemosa*), Shami (*Prosopis spicigera*), Darbha (*Desmostachya bipinnata*), Rui (*Calotropis gigantea*), Khair, (*Acacia chundra*) Aghada (*Achyranthes aspera*) and Durva (*Cynodon dactylon*) as Samida or oblation into the fire. The study indicated significant decrease in growth of aeromicroflora and strongly recommends biofumigation as an effective, safe, inexpensive and ecofriendly technique for air disinfection and control of respiratory diseases. [11]

Agnihotra is a gift to mankind from the ancient Vedic sciences of bio-energy, agriculture and climatic engineering and also stated as healing fire in ancient science of Ayurveda. Agnihotra is known as a ritual to seek prosperity for the family by offering a prayer to the Vedic God Agni ('Fire'), as first prescribed in the Yajurveda (7000 BCE) Krishna Yajur Veda Taittiriya Samhita Book Chapter 6 Sutra 9. Later it was elaborated in the Atharvaveda (c.1000 BCE). (Atharva Veda Book 19 Chapter 55 Sutra 3)[12]

The Agnihotra stands for the integration of human resources with the spiritual knowledge as Agni is both physical and spiritual. However, the concept of Agni-hotra can only be completed through the reciting of the exact **Vedic Mantras**.

IV. THE DAILY RITUAL OF AGNIHOTRA

Agnihoma is mentioned in Yajurveda and also found in various Brahmanas. They are given in Ashwalayana Prasara and Gobhila and other Grihyasutras(Vedic rules for domestic ceremonies) as part of

Apusan homa, the regular rituals or ‘nityakarmas’. [13] Homa is but a daily ritual to be performed by **householders**. It is one of the **five great duties** (pancamahayajna) of every householder. It should be performed by an individual of a family on a daily basis at the exact time of **Sunset and Sunrise**. To start it for the first time, one has to start by oblation to **Agni in the evening**. In the morning the oblation is offered to the **Sun**.

These mantras have been referred as nityakarmas or daily rituals in the vedic texts. Agnihotra which has scientific, psychological and para-psychological implications needs to be performed only in a stipulated way and at stipulated times. The shape of the pot for ritual is most important. [13]

The Vedic of procedure of Agnihotra where two oblations with rice are made into the specially lit fire 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). [14]

As the revived Vedic procedure, Agnihotra fire requires the following inputs:

1. Specific organic substances (unbroken rice grains known as Akshat)
2. Inverted copper pyramid (Fig 6)
3. Cow ghee or the clarified butter
4. Cow dung cakes
5. Agnihotra (fire sacrifice of rice grains) at exact timings of Sunrise and Sunset
6. Vibrational 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 grains of rice smeared with little cow ghee are put in the fire along with chanting of specific Mantras.

Fondly known as ‘Shree’, Gajanan Maharaj initiated his disciples Vasant Rao Paranjpe and MG Potdar, in his spiritual path. Mr Potdar propagated Agnihotra message right from 1963 to 1974 i.e. till his passing away from this world. He worked with farmers mainly in Central India. 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.

The fumes produced by agnihotra were shown to offer benefits like reduction of pollution levels, **antibacterial resistance**, and the ash produced after agnihotra has been shown to offer agricultural benefits like purification of water and even neutralization of radioactivity. [14]

Mechanism of Purification

The purification process at the atmospheric level is thought to be brought about through specially prepared fire. According to Vedic Science, "At sunrise the many fires, electricities, ethers and more subtle energies emanating from the sun extend all the way to the Earth and produce a flood effect at those coordinates where the sun is said to rise". According to Vedic knowledge, Agnihotra effects are mediated by changes in atmosphere within some area around a site of its performance. (Paranjpe)

The Yajyas (ritual, i.e. strictly determined fires, offerings and mantras), as this system of knowledge explains, allows better absorption and transformation of incoming solar/cosmic radiation and its interaction with energies of the Earth, soil, water and the living organisms. It is postulated that energies of multiple characteristics (“electricities” in plural) are involved, and at least some of them act at “a more subtle level”.

Since then a growing number of claims originated from various regions of the world, indicating that with performance of Agnihotra alone or along with other Homa Therapy rituals like Tryambak homa the quantity and quality of agricultural crops (even with no need of fertilizer use) was greatly improved along with their resistance to unfavourable **environmental factors and pests**.

The first ever systematic studies by agricultural engineers were done in South America, in Peru. A fungal disease Black Sigatoka had affected banana plantations destroying up to 90% of the crops. The fungal population had become resistant against the fungicides. Though the banana had been the staple diet for most of the population, many farmers were about to give up their banana plantations. ‘Homa Organic Farming’ was started here using the resonance technique (in which **ten Agnihotra pyramids** were arranged in a special configuration to energize a large area of up to 80 hectares. According to reports of government engineers Black Sigatoka infection was totally eradicated. [15] According to further scientific reports Agnihotra had also helped the agricultural crops like tomatoes, sugarcane and banana to fight against the **insect pests**. [16]

V. OBSERVATIONAL STUDIES CONDUCTED BY AUTHOR

Above example highlights the immense benefits that the Agnihotra offers. As said earlier the Agnihotra can also be performed as a **small homa** by the householders. I (Vasanti Limaye) conducted studies where I performed evening and morning agnihotra regularly and witnessed profound and peculiar effects on plants growing on my home terrace. [17] And the first observation was that the insects covering the whole plant were slowly reduced in the agnihotra atmosphere. (Fig 1)



Figure 1: Reduction in insect infestation by Agnihotra

Peculiar Effects of Agnihotra Vapour

The author studied the effects of agnihotra vapour for about 3 years on plants kept on home terrace and also in a field. [18], [19] The observed effects at both the sites (terrace and an open field) were almost similar which could be outlined as:

- | | | |
|-------------------------------|-------------------------------|---------------------------|
| 1. Breaking of seed dormancy | 4. Apical Dominance | 7. Induction of flowering |
| 2. Initiation of new growth | 5. Cell elongation | 8 Setting of Fruit |
| 3. Cell division | 6. Change in tropic curvature | 9. Senescence |
| 10. Lateral shoot initiation. | | |

The keen observations of these effects and the analytical research of the observed effects in published scientific literature had led to me to make an important conclusion that the agnihotra vapour or fumes have acted on plants by generation of a particular class of growth regulator substance or phytohormones. [18, 19] The steroid plant hormone which was shown to have these peculiar effects was shown to belong to the class of **brassinosteroids** in the scientific literature. Through these observations on plants growing in Agnihotra atmosphere, I could also provide a **scientific explanation** for better yield of the agriculture plants which was happening through the stimulation of **growth regulator substances**, not only through better nutrition, particularly the **6 the class of plant hormone** known as **brassinolide**, which have been specifically linked with the above effects. Reports have repeatedly said that agnihotra has immensely contributed to disease resistance of crops growing in agnihotra atmosphere and brassinolide is the particular hormone which has been scientifically proved to be related to development and growth and also to stress, disease resistance and protection against pests. [20]

Effect of Agnihotra Vapour on Mold Growth

In the light of above discussion, I would like to add that the agnihotra vapour has also proved itself to inhibit the mold growth, a kind of fungus growing inside a refrigerator.(Fig 2)



Figure 2 Mold growth inside a Refrigerator

Mold produces gasses called as microbial volatile organic compounds (MVOC). Many of these gasses may have a musty odor. [21]. In around 2 day exposure to Agniotra vapour, bad odour in the refrigerator was overcome. Mold also produces **spores** which tend to be released when the mold has dried up and has been forced to stop growing. As a survival response, spores are produced, which can then remain viable for years or even decades. If the mold is actively growing, it is likely that the growth has a moisture source and has not dried to the point of sporulation and will produce the odiferous substances. Even when the mold dies the spores could be there which can again grow when favourable moist and anaerobic conditions are available

After exposure to agnihotra vapour the bad smell had subsided in two days. After that moist bread pieces were kept in refrigerator and doors were closed. At the time of Agnihotra the doors of refrigerator were opened for exposure to the Agnihotra vapour. Agnihotra was performed for about 15 days with all the windows or doors of the room open. After 15 minutes exposure the doors of refrigerator were again closed. No mold growth was seen on moist bread when the refrigerator was opened in the morning. After that again Refrigerator was opened and closed for 8 to 10 days as described above. The temperature was also high during that time. There was no bad odour in the refrigerator. Moist bread was kept inside it with the doors closed. No growth was seen on the bread even after 7 days. This experiment confirms that even the spores of mold were killed due to agnihotra vapour.

Experience tells us that Agnihotra should be performed in open spaces for best results where free circulation of air is available not in a closed room. All the windows in the room were opened when agnihotra was performed. Since the energy is dissipated to large distances it can be absorbed by plants. This highlights the kind of life energy generated through agnihotra which is carried through air particles, attaching to them, charging them and moving with them which is absorbed by the plant surfaces like leaves. Since agnihotra has been shown to hasten up seed germination, this kind of energy is able to percolate through soil. It is possible that the vapour generated through agnihotra also permeates into water.

Effect of Agnihotra on Carrot Tops

The carrot tops were taken in triplicate and placed in shallow stainless steel bowls. One set was exposed to agnihotra vapour but the other set was used as control. (Fig 3) In agnihotra atmosphere the growth had appeared very fast in 5-6 days. In control growth appeared in tops only after 15 days or so.



Figure 3 No Growth in Control



Figure 4 Growth in Agnihotra atmosphere

As there were no leaves, when the carrot tops were immersed in water, the vapour has possibly acted by permeating into the water.

A Novel Experiment

In another experiment, water in a shallow plate was exposed to agnihotra vapour and that water was poured over a rose plant daily after the morning agnihotra. It is important to note that the rose plant was kept far away from agnihotra atmosphere. The most startling observation was that the rose plant had produced shoot at the base similar to the rose plants kept in **agnihotra atmosphere** on a terrace and also in a field had produced. Figure (5A,B, C)



Figure 5A: Production of shoot 5 B: On terrace 5C In a field
(5A shows the shoot that was produced at the base of plant on which water exposed to agnihotra was poured)

VI. PROPERTIES OF MATERIALS USED IN AGNIHOTRA

Agnihotra Vessel: Inverted Copper Pyramid

The inverted pyramid pot is known to be a receiver of cosmic energy. Copper is the best conductor of heat and electromagnetic waves. The Agnihotra mantras in Sanskrit cause specific vibrations beneficial to the mind and the atmosphere. The shape of the copper pot helps in better utilization of incoming air and helps in proper combustion of substances.



Figure 6: Inverted Copper Pyramid used for Agnihotra

The Cow Ghee (Clarified butter)

Referred to as the mother of all medicines in Ayurveda, cow ghee acts as a carrier of subtle healing energies. The cow ghee in which the rice grains are smeared before the oblation, helps in rapid combustion of wood cellulose and carbohydrates in rice. When all the volatile substances are diffused in the surrounding atmosphere, these are further subjected to photochemical reactions in the sunlight. My experiment has shown that more profound effects of agnihotra vapour have been observed in plants kept in **direct sunlight**.

The fumes, smoke or vapors from the burning components rise high up in space. Volatile oils generated in the especially lit fire get diffused in the surrounding atmosphere along with the air particles. Since these oils have distinct good smell, the foul odors are automatically replaced. This aroma can be experienced easily in the surroundings when Yagya is performed due to diffusion of substances in pine like terpinol and oils of sandalwood, camphor and clove. Even the simple everyday agnihotra homa produces a desirable smell because of the burning of rice grains and cow ghee.

It should be emphasized that the purpose of agnihotra is not to burn the substances that are added in the form of oblations, rather it is to **vaporize** them, i.e. to heat them just to the extent that they are transformed into vapor phase. [22] Thereby, these substances diffuse into the surrounding air and transform the air quality favourably. Coupled with the buoyancy and aerodynamic effects due to the thermal energy released by the base

fire, the **vaporized substances** traverse to all nooks and corners of the enclosed room. In other words, the base fire is utilized to convert the herbal substances into **gaseous phase**, and furthermore, to aerodynamically transport the same to the entire surroundings in a most effective manner. The buoyancy forces enhance the transport processes.

The lipids in the cow milk mainly consists of 97% Triglycerides and much smaller proportions of phospholipids and sterols which are associated with the membranes of milk lipid globule. Mono and diacyl glycerols, free fatty acids, esters, cholesterol, soluble vitamins, carotenoids and squalene also occur in minor amounts along with small amounts of hydrocarbons. [23]

Cow Dung Cakes

Cow dung cakes extracts have been shown to have antibacterial properties. [24]The fumes generated by Agnihotra have been proved scientifically to possess antibacterial properties as reported earlier. Fumigation by using chemicals like formaldehyde has hazardous effects on the body, but Agnihotra fumes have not only been reported to control microbial load but also to heal the atmosphere and purify the air. The reduction in microbial load may be caused by volatile organic compounds released during the burning of Agnihotra material which is mainly constituted by **cow dung cakes**. There might be antimicrobial nano-particles which are released during burning of Agnihotra materials acting as fumigants. As mentioned earlier, Agnihotra and fumigation in presence of cow dung cakes kind of produces a sterile atmosphere as proved by many microbiological studies conducted in India.

Raw Unbroken Rice

Raw unbroken full rice grain is just right to use, it being the most abundant food grain across the globe. It is an important component of Agnihotra ritual. The rice grains burn with a sound in Agnihotra. Gases such as ethylene oxide, propylene oxide, formaldehyde, vita propyo lactone are released by burning of rice. These gases help in purifying the atmosphere and are helpful in killing the microbes. [25]

Agnihotra Ash

Positive role of Agnihotra ash in organic farming has been shown through certain scientific studies. Agnihotra ash has been reported to have increased the solubility of Phosphorus content in the soil. [26] Ash was shown to have positive effects on germination of rice seeds and the soil fertility. [27] [28]

VII. AGNIHOTRA HOMA AND TRAYAMBAK HOMA

In some of homa farming methods Agnihotra is combined with the Trayambak homa. Trayambak homa is performed with the use of inverted copper pyramid just the one which is used for Agnihotra, but in a different vessel. The cow dung cakes are arranged in the pyramid and the fire can be lit with the help of camphor. In Trayambak homa the oblation of **cow ghee** alone is offered in the fire along with chanting of **maha mritujay mantra**.

In the following study done by the Author, **Trayambak homa** was performed by the author before performing Agnihotra daily in the same room. The windows were opened before performing Trayambak homa and it was performed just for 5 minutes for 6 days. It was observed that long vertical buds were formed on the plant just facing the window where the Trayambak homa was performed. Another plant of the same species growing nearby did not form buds as it was not getting exposed to the vapour. Two of observed effects of phytohormones – cell elongation and bud formation were observed. Every day new buds were formed. But **curious effect** that was observed was that the buds were formed but they did not **open**. (Fig 7A)

Vaporized chemical substances that were formed by burning together of cow dung cakes and cow ghee were triggering cell elongation and bud formation. The carrot tops were also exposed to Trayambak homa vapour. But even after 5-6 days exposure no effect was seen on carrot tops.

On new moon's day Agnihotra was started in the evening and then continued for the fortnight. The next morning it was seen that not only the flower had opened, but also a change in curvature was observed. (Fig 7 B) Change in tropic curvature is another feature of plants exposed to of Brssinolide. Positive effect on carrot tops was observed when these were exposed to agnihotra vapour. (Fig 4A) It is important to note here that new growth and cell division was observed only in presence of agnihotra vapour. It is likely that volatiles materials released from **rice grains** are responsible for this.

Once the flowers had been formed and opened, the trayambak homa vapour was not able to induce **budding** however, it had promoted senescence as observed by author in earlier studies.



Fig 7 A: Production of buds by Tryambak homa, **7B:** Opening of flowers by agnihotra vapour

VIII. DISCUSSION

The plant steroid hormones, **brassinosteroids (BRs)**, and their precursors, **phytosterols**, play major roles in plant growth, development, and stress tolerance. Phytosterols are present as free sterols (generally the most abundant form) or in conjugated forms (steryl esters, acyl steryl glycosides, and steryl glucosides). The brassinosteroids (BRs) show structural similarity to the Steroid hormones of vertebrates and insects. 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. [29] The author's observations on the effect of agnihotra vapour are almost similar to the effects produced by brassinosteroids. The transition to flowering is known to be regulated by numerous interacting endogenous and environmental cues, of which brassinosteroids (BRs), a group of polyhydroxylated steroid phytohormones, appear to be linked to the regulation of flowering time. [30] Induction of flowering was the major effect observed by the author in the field where the plant which had already produced lemons had reverted to produce flowers. The above observations have reaffirmed the inference made by the author that Agnihotra vapour has similar action as that of hormone **brassinolide**. [18] [19]

The history of BR research is as interesting as the observations made by the author. Turning point in the Brassinolide research was the discovery of the Arabidopsis **dwarf mutants** in 1996. These BR-deficient mutants were found to revert to the wild-type phenotype following **BR treatment**. Arabidopsis, BR det2 mutants exhibited **delayed flowering time** as compared to the wild types. It was also shown that flowering time in Arabidopsis was also affected by the level of different BL precursors. [30]

All the observations made by the author earlier and the present carrot experiment in particular point toward a fact that volatile substances produced by the Trayambak and Agnihotra Homa are **perceived on the surface**. Agnihotra vapour had led to increase in leaf area and number, however in rainy season the nodes of the same plant had produced long roots. (Fig 8 A, B)



Figure 8A, Plant in summer with big leaves, **8B.** In rainy season it produced long roots

BR signaling and perception in *Arabidopsis thaliana* and rice (*Oryza sativa*) - dicotyledonous and monocotyledonous models, respectively - is mediated by the receptor kinases located on **extracellular domains**. [31] However, phytosterols are synthesized in the smooth ER, as evidenced by the **subcellular localization** of the **sterol biosynthetic enzymes**. Overall, the genes/enzymes of the main phytosterol biosynthetic pathway

appear well conserved between plant species, including dicots and monocots. The research also says that phytosterol synthesis is also dependent upon environment factors and they have important role as signalling molecules.

Brassinosteroids (BRs) offer the unique possibility of increasing crop yields through both changing plant metabolism and protecting plants from environmental stresses. [32]

Chemical Structure of Brassinosteroids

BRs are steroids carrying at least one oxygen moiety at the **C-3 position**, and one or several additional ones at the C-2, C-6, C-22, and C-23 positions. BRs are also classified depending on the **alkyl group in the C-24** position of the side chain (C-27, C-28, and C-29 groups). More than 70 BR compounds have been isolated from plants, including conjugated forms with the most common modifications being the esterification, glycolation and sulfonation of the steroidal skeleton. [33] Evidence shows that these conjugations take part in the control of BR homeostasis as irreversible inactivation. Conjugates of BRs may also serve as temporary storage forms and act as transport components. BL, **Brassinolide** is the most biologically active BR. The biosynthesis of BRs is under negative feedback regulation by active BRs, and is controlled by both negative and positive transcription factors. In contrast to other hormones, BRs are synthesized at their site of action and are not subjected to long-distance transport. At the cellular level, however, BRs are subjected to intracellular transport, from their site of biosynthesis in the ER to the **PM** where their perception occurs. [34]

Synthesis of Brassinosteroids and regulation of plant growth

Plant growth is regulated by environmental as well as hormonal signals. The role of BR signaling pathway seems to assure the growth promotion of the plant under favourable environmental conditions, and, to repress it under stress conditions.



Figure 9: Breaking of seed dormancy

Germination of a new plant from the dormant seed (Fig 8) and shedding of leaves at the time of flowering, and senescence of old leaves at the onset of new leaf and appearance of new leaves at the base after some time seems to verify the above fact. (Fig 10)



Figure 10: Formation of new leaves

Senescence of old leaves and triggering of the formation of new leaves is a characteristic feature of brassinolide. Senescence, flowering and triggering of new cells was invariably observed in plants on exposure

to Agnihotra. However, the possibility of existence of a complex crosstalk between BR and several environmental signals, including light, temperature, and water along with numerous interactions between BRs and other hormones at the level of their biosynthesis and signaling pathways cannot be denied.



Figure 10: Senescence for disinfection of air,

The present study and the previous studies conducted by author strongly suggest the production of brassinosteroids in the agnihotra atmosphere. The chemical composition of vapour produced by Trayambak homa where the oblation of only cow ghee is made seems to be different from the chemical composition of agnihotra homa as suggested by the results. (Fig7 A & B) Questions like do both procedures produce different types of brassinolides or induce the synthesis of brassinosteroids through production of phytosteroid precursors needs to be answered and confirmed. These findings are very significant from the point of view of both agnihotra and agriculture.

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