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Electric Current Effect on Plant Growth of *Withania somnifera* (L) Dunal (Ashwagandha)

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Abstract
Withania somnifera (L) Dunal (Ashwagandha) has been used in Ayurveda, Indian system of traditional medicine. Ashwagandha is one of the prime drugs of Ayurveda material medica. The present investigation to find out seeds Germination Percentage and Plant Growth of *W. somnifera.* Plant network of electric signals which help in cellular signaling and co-ordination. Plants show adaptations to their surroundings as and when required, which almost certainly controlled through these regulatory electrical signals, such signals can regulate certain basic metabolic processes in plants and thus have potential in regulating plants growth and function. However, it is theorized that an external supply of mild electric current can influence or imitate the role of natural signals that regulate metabolic processes in plants. Therefore, supplying such electric current would act as signal and would act as lead to enhanced metabolism in plants often lead to rapid and better growth. In this work the effect of such external electric current on plant were evaluated on basis of plant growth parameter and quantitative estimation of secondary metabolites in such plant. Ashwagandha were used as starting material and electric current stimulation (electric current range= 2V, 4V, 6V, 8V and 10V) was perform on imbibes seeds. The result show that electric current has (in the range of 2V to 10V) striking effect of growth of plant. However, for each plant under consideration a optimum current range was identify which promote their growth. Weak currents stimulation used as increase crop production and to speed crop growth.

Keywords
Electric stimulation, Promote growth, *Withania somnifera* (L) Dunal.

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INTRODUCTION:
***Withania somnifera* (L) Dunal** member of Solanaceae family popularly known as Ashwagandha. Indian winter cherry has been used in Ayurveda, Indian system of traditional medicine. It is a small evergreen shrub that grows to roughly four to five feet tall (Singh et al., 2001; Khare, 2007; Forman & Kerna, 2018). The species name *somnifera* means 'sleep-inducing' in Latin, indicating that to it are attributed sedating properties, but it has been also used for sexual vitality and as an adaptogen (Langade et al., 2019). Ethno-medicinally, decoction of the roots is used for colds and chills and to increase the tone of uterus after miscarriage. An infusion of the root bark has been used for asthma; a use also common to traditional herbal practices in India. In Ayurvedic medicine, its root is used as an anti-inflammatory drug for swellings, tumors, scrofula and rheumatism and as a sedative and hypnotic in anxiety neurosis. Leaf possesses anti-inflammatory,

hepatoprotective, antibacterial properties. Fruits and seeds are diuretic. *Withania* somnifera, however, has an advantage over Panax ginseng in that it does not appear to result in ginseng-abuse syndrome, a condition characterized by high blood pressure, water retention, muscle tension, and insomnia (Khare, 2007; Modhvadia, 2009; N. Singh et al., 2011; Bagetta et al., 2012; Forman & Kerna, 2018). This plant is used in more than 100 formulations in Ayurveda, Unani and Siddha such as Shwagandhadi-churna, Ashwagandha-rasayana, Ashwagandha-ghrita, Ashwagandha-rishta, Ashwagandha-taila, Madhyamanarayana-taila, Brihat Ashwagandha-ghrita, Brihachchhagaladya-ghrita, Saraswata-churna, Pramehamihira-taila. Ashwagandha is one of the prime drugs of Ayurveda material medica (N. Singh et al., 2011). It is a reputed health food and herbal tonic and used for cardiovascular diseases in ethnomedicine. The drug is reported with anti-inflammatory, anti-arthritic, cardio protective, anti-stress, tranquillizers type sedative activity, hypoglycemic, thyro protective activity and proved to be an effective remedy in cancer cells and the malignant growth of different organs. The drug is studied in all the scientific aspects and proven to be the broad-spectrum remedy in various experimental studies. This review may help for the further evaluation of the drug for the cure of the ailments which are threat to human being. The curative properties of the leaves and roots are attributed to Withaferin A. Withaferin A is antitumour, antiarthritic and antibacterial. Experimental Pharmacology Large number of experiments has been conducted to evaluate it efficacy on different biological systems (Sangwan et al., 2004; Verma & Kumar, 2011; Afewerky et al., 2021; Vinod & Senthil, 2021).

Thorough review of Ayurvedic literature and scientific research journals and articles were executed and presented in concise manner. The review includes various activities of Ashwagandha in experimental models and clinical evaluation of the drug in various dosage forms. Indication described in Ayurvedic Medicine In Ayurvedic classics, syncope, epilepsy, cachexia, mania/psychosis, emaciation, piles, diabetic carbuncle, tumour, cervical lymphadenitis, fistula-in-ano, ulcer in genitalia, gout, diseases of skin, vitiligo, bone fracture, stiffness in lumbo-sacral region, sciatica, lockjaw, stiffness of the knee, cardiac failure, disorders of female genital tract and abscess. In this investigation the main object has been to study the possible effect of weak electric currents developed have been applied to the root areas of the plants (Charles, 1973; N. Singh et al., 2011; Verma & Kumar, 2011).

Electric current serves as the role of an elicitor, and trigger mechanism involved in biosynthesis of secondary metabolites in plants (Kaimoyo et al., 2008). Present study on weak currents stimulation applies on seeds to detect seed germination rate and observed plant morphology. Most plant cells for sensing the weak currents that flow within organisms to control their growth. The physical application of weak electrical currents can be interact with these to stimulate growth such as seed germination, plumule and radical formation (Goldsworthy, 1996). Weak currents stimulation used as increase crop production and to speed crop growth (Pohl & Todd, 1981).

MATERIALS AND METHODS:

Plant material: The experimental nature of this work demanded that the effects of electric current be studied on seeds of *W. somnifera* (Fig. 7)

Electric stimulation of seeds: The seeds of plant were to be given five different treatments of electric current such as 2V, 4V, 6V ,8V and 10V. For the five treatments 500 seeds and 100 seeds in control set *i.e.* total 600 seeds of each plant were taken. The seeds were soaked in 1% sodium chloride for 2hrs. This pre- soaking of seeds before sock treatment is important, as imbibed seeds will conduct electricity more efficiently. The seeds of each plant were the dipped in Sodium chloride solution (1%) in electrophoresis tank serves a convenient apparatus for the electric stimulation. The current was regulated through a digital power bank (power supply) and was set a to desired intensities as required (2V, 4V, 6V ,8V and 10V). The electric stimulation was carried out for 1hr after which the seeds were rinsed with tap water to remove adhering sodium chloride. The seeds treatment at different intensities of current was separately kept germination. Seeds were placed on germination soil (Cocopeat). It was ensured that seeds of different treatment set were kept separately. The control seed (100 seeds of each plant) were also kept for germination under identical condition, observation regarding germination percentage and root & shoot length were made after standard germination periods which are different for each type of plant.

Media*:* The seeds after germination were cultivated through cocopeat. Cocopeat is the non- fibrous, spongy, light weight, corky material that holds together the coir fiber in coconut husk.

Measure Plant Height: After seed germination, seedlings heights were measured in cm. That was by scale from the soil level to the top of seedling. Plant height was recorded from the 20th day of after the

seed sowing. The seedling height was measured with specific time interval.

RESULTS AND DISCUSSION:

According to Blackman et al., 1924, significant increase in growth of the plant was observed under the low intensity of electric current. Present study has showed interlinking with the outcome of Blackmans report. According with the observation the effect of electric current stimulation on plant was observed and recorded in three phases. Initially the seeds of plant were stimulation and germination percentage.

Root and shoot length were evaluated. After treatments of different voltages seeds germinated faster in 16 days of 10 V treatment. Seeds germination rate is slower in 20 days of control treatment

Plumule formation faster rate in 18 days of 10 V treatment. Plumule formation rate is slower in 22 days of control treatment (Table No. 01). Plant height showed significant increase. As compared to control and 2V, plants from 4V and 6V have showed increase in plant height. Where in 8V and 10V in plant height was short by other observation recording (Table No. 02).

Direct current had positive impact on plant germination and growth. Minimal treatment viz. 2V and 10V of electric current are beneficial in terms of better morphology of plant. Height of plants can get increased under electric treatment. Hence, it has increased biomass of plant too. Similarly change occurred in all the tread seeds of *W. somnifera* at 4V get 90% of seeds was germinated, at 6V also get 90% seeds was germinated. Plant height was rapidly increased at 2V and 6V. Similarly, plant height can increase in 4V and 6V but as compare control. As compare to control, 4V and 6V plant height was significantly more in 8V and 10V. similarly in 2V the plant height is near about 10 is greater than control. Plant germination and growth can be positively stimulated with direct current, but treatment with too high voltage or too long time can have negative impact. In order to determine voltage and time of treatment with direct current, synthesis of secondary metabolites can be estimated.

Table No 01: Observation Table

Days	Control	2V	4V	6V	8V	10V
Germination Days	20	18	18	17	17	16
Plumule Formation- Days	22	20	20	19	19	18
Germination Percentage - Days	80%	85%	90%	90%	95%	95%

Table No. 02: Plant height (cm) of *Withania somnifera* (Ashwagandha)

Day	Control	2V	4V	6V	8V	10V
20	-	0.5	0.5	0.5	0.5	0.5
25	0.5	0.7	0.7	0.7	0.7	0.7
30	0.7	1	1	1	1	1
35	1	1.5	2	2	2	2
40	2	2	3	3	3	3
45	3	3	4	4	4	4
50	3	4	5	5	4	4
55	4	4	6	6	4	4
60	4	4	7	7	4	4

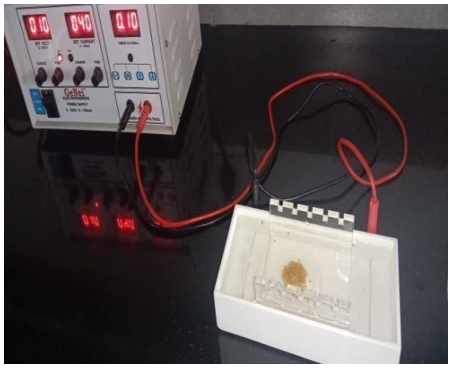

Fig. 1- Electric Current to seeds

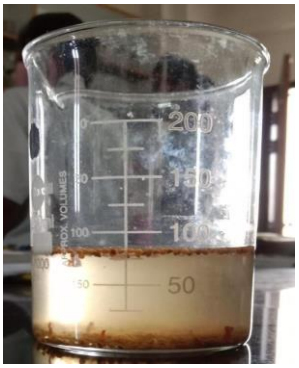

Fig. 2- Soaking of seeds in 1% NaCl

Fig. 3- Plumule Formation in *Withania somnifera* (L) Dunal (Ashwagandha).

Fig. 4- Plant height recording - Control & 2V plant

Fig. 5- Plant height recording - 4V & 6V

Fig. 6- Plant height recording - 8V & 10V

Fig. 7- Plant Habit

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