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A REVIEW ON ALTERNANTHERA SESSILIS

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Abstract:
Althernanthra sessilis commonly called as sessile joyweed and dwarf copperleaf is native to tropical and subtropical regions of the world. It is used as a vegetable specially in sri lanka and some asian countries. In certain regions of South East Asia, the leaves and young shoots are consumed as vegetables in karnataka, andhra pradesh and tamil Nadu, the leaves, flowers and tender stems are consumed as vegetables. As an herbal medicine, the plant has diuretic, cooling, tonic and laxative properties. It has been used for the treatment of dysuria and haemmorrhoids. The plant is also believed to be beneficial for the eyes, and is used as an ingredient in the making of medicinal hair oils and Kajal.

Key Words:*Sessile joyweed, ponnaganti, campesterol, anti-diabetic activity, anti-microbial activity.*

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INTRODUCTION:

Althernanthra sessilis is an annual or perennial herb 0.2-1 m high, with strong taproots. The leaves are simple, opposite, shortly petiolate or sessile, broadly lanceolate or spatulate to almost linear, 0.6-5 cm long, and 0.3-1 cm wide. They are attenuated at the base, and the apex is acute blunt, with entire, glabrous or pilose (thin, fine, articulate hairs) margins. The inflorescences are dense, sessile, silvery-white clusters of compressed spikes in the leaf axils; perianth segments are equal in length, acute, 1.5-2.5 mm long with a short point. Bracts are ovate, concave, 0.3-1 mm long and persistent; bracteoles are oblong-ovate, 1-1.5 mm long, may be acute, and not deeply lacerated. Sepals are 2-3 mm long, white or purplish, glossy with a green base, glabrous or with a few long hairs, and a strong midrib. The fruits are indehiscent, a small, flattened, obcordate or obovate utricle, 2-2.5 mm long, enclosing the seed. Seeds are dark-brown to black, disc-shaped and shiny, about 0.8-1 mm in diameter. They are light sensitive**.[1]** A decoction is recommended as an herbal remedy to treat wounds, flatulence, nausea, vomiting, cough, bronchitis, diarrhea, curative, protective or promote purposes. Its root can relieve inflamed wounds. A. sessilis is used as a local medicine often in mixtures with other medicinal plants, to treat hepatitis, tight chest, bronchitis, asthma and other lung troubles. The leaves and shoots boiled and drunk as an antihypertensive remedy.**[11]**

DISTRIBUTION

In Noakhali district of Bangladesh, the plant is used to treat gonorrhea, low sperm count and leucorrhea. In several areas of Faridapur and Rajbari districts of Bangladesh, the plants are used by folk medicinal practitioners fpr treatment of severe pain. The tribals of Bargarh district, India use the plant to treat blood dysentery. Different communities of Uttra Khannada district of Karnataka, India use the plant to treat ulcers, cuts and wounds. The Irula tribals of Kalavai, Vellore district, Tamil Nadu, India, treat headache, hepatitis and asthama with the plant**. [2]**

TAXONOMICAL CLASSIFICATION

Domain: Eukaryota
Kingdom: Plantae
Phylum: Spermatophyta
Subphylum: Angiospermae
Class: Dicotyledonae
Order: Caryophyllales
Family: Amaranthaceae
Genus: Alternanthera
Species:Alternanthera

Vernacular Names

Tamil:Ponnankanni ,Citai,Koduppai
Malayalam: Meenamgani,Ponnankannikkira
Sanskrit:Matsyaki, lonica
Hindi:Gudrisag, Garundi
Kannada:Honagone soppu
Telugu:Ponnagantikura
Bengali:Chanchi, Haicha, Sachishak
Marathi:Kanchari
Manipuri:Phakchet

Other Geographical names:

French:Brede Chevrette, Magloire.
Portuguese:Bredo-D, Periquito-Sessil,Perpétua.
Indonesian:Daun Tolod
Malaysia:Keremak.
Sinhalese:Mukunu-Wenna
Chinese:Lian Zi Cao, Bai Hua Z[12]

Fig:1 Althernanthra sessilis

Chemical Constituents:

Herb contains hydrocarbons, ester, and sterols, such as stigmasterol, campesterol, ß-sitosterol, a- & ß-spinasterol, a-stigmasteanol and palmitates of sterol; it also contains 24-methylenecycloartanol and cycloeucalenol. Saponins have been isolated from the leaves. Roots contain lupeol. Young shoots contain protein and iron. It also contains 5-a -stigmasta-7-enol.[10]

ACTIVITIES REPORTED ON ALTERNANTHERA SESSILIS:

1. ANTIHYPERGLYCIMIC ACTIVITY:

Plant material collection: Aerial parts (leaves and stems) of A.sessilis were collected.
Preparation of methanolic extract of aerial parts: Aerial parts were cut into small pieces, air-dried in the shade, and 100 g of dried and powdered leaves and stems was extracted with methanol (w:v ratio of 1:6, final weight of the extract 8.03 g).
Chemicals and drugs: Glibenclamide, aspirin, and glucose
Animals: Swiss albino mice (male)
Oral glucose tolerance tests for evaluation of antihyperglycemic activity

The fastened mice were grouped into six groups of 5 mice each.
Group 1: Received vehicle
Group 2: Received standard drug
Group 3-6: Received extract (MEAAS) at doses of 50,100,200 and 400 mg per kg body weight.
Following a period of one hour, all mice were orally administered 2 g glucose/kg of body weight. Blood samples were collected 120 minutes after the glucose administration through puncturing heart. Blood glucose levels were measured by glucose oxidase method. The percent lowering of blood glucose levels were calculated according to the formula described below.

Percent lowering of blood glucose level= (1–We/Wc)×100,

Where We and Wc represent the bloog glucose concentration in glibenclamide or MEAAS administered mice (Group 2-6), and control mice (Group 1) respectively.

Antihyperglycemic activity evaluation results

Administration of MEAAS at doses of 50, 100, 200 and 400 mg per kg body weight, the concentration of blood glucose in glucose-loaded mice was reduced significantly by 22.9, 30.7, 45.4 and 46.1% respectively. By comparision, a standard antihyperglycemic drug, glibernclamide, when administered to mice at a dose of 10 mg per kg body weight, reduced blood glucose level by 48.9%.**[2]**

Table 1: Effect of crude methanol extract

Treatment	Dose (mg/kg body weight)	Blood glucose level (mmol/l)	% lowering of blood glucose level
Control	10 ml	5.60 ± 0.27	-
Glibenclamide	10 mg	2.86 ± 0.26	48.9*
(MEAAS)	50 mg	4.32 ± 0.16	22.9*
(MEAAS)	100 mg	3.88 ± 0.24	30.7*
(MEAAS)	200 mg	3.06 ± 0.11	45.4*
(MEAAS)	400 mg	3.02 ± 0.17	46.1*

All administrations were made orally. Values represented as mean ± SEM, (n = 5); *$P < 0.05$; significant compared to hyperglycemic control animals.

[2]

1. ANTIDIARRHOEAL

Material and Methods Collection and identification of Plant material: Fresh plant material of Alternanthera sessilis were collected during the month of May and June

Extraction and Preparation of the Extract:

After collection, the plant materials were air dried for one week. This was further subjected to another one week of drying in an oven maintained at 400C. The leaves were pulverized into a smooth powder. The pulverized plant material was mixed with distilled water and left for 72 hours. The mixture was stirred at 6 hours intervals using a sterile glass rod. At the end, the extract was passed through filter paper. The filtrates were concentrated with the aid of a vacuum pump and rotavapour at 400 C. The concentrated extract was refrigerated prior to use.

Animals: Albino Swiss mice

The experiment was performed by inducing diarrhoea using castor oil.

Table: 2

Table 1: Effect of *A .sessilis* Linn aqueous extracts on castor oil induced diarrhoea in mice.

Treatment	Dose	Total number of faeces	Total weight of faeces.	% Inhibition
Control (Water)	10 ml/kg p.o.	25.45 ± 2.55	20.45 ± 3.69	0.00
Test-1	200 mg/kg p.o.	11.76 ± 2.24[a]	11.92 ± 1.34[a]	41.71
Test-2	400 mg/kg p.o.	12.65 ±1.76[a]	10.55 ± 1.74[a]	48.41
Atropine	0.1mg/kg I.p	7.96 ± 4.12[a]	2.30 ± 0.45[b]	88.75

Values are mean ± SEM (n=5)
[a]P < 0.01, [b]P < 0.001 vs. control, student's t- test.

Results and Discussion

The results indicate that the aqueous extract of Althernantha sessilis possesses significant antidiarrhoeal activity due to its inhibitory effect on gastrointestinal propulsion and fluid secretion.[3]

2. ANTIMICROBIAL AND ANTIFUNGAL ACTIVITY

Plant Material:

Fresh plants of Alternanthera sessilis were collected and washed thoroughly 4-5 times with running tap water and then finally with sterile water and dried in shade at room temperature for 20-25 days. The dried plant material was made into coarse powder and sieved, and then used for crude extraction. Solvents like water, ethanol, methanol, acetone, ethyl acetate, chloroform and petroleum ether were used for extraction.

Extraction:

20 gm powder of each plant were soaked separately in 200ml water, ethanol, methanol acetone, ethyl acetate, chloroform, petroleum ether in conical flask and kept in shaker for 24 hours. After the extract was filtered and collected into glass vials. The process was repeated for 3 times with same material but using fresh solvents. The extracts were collected and concentrated at 40°C under reduced pressure using rotary evaporator. The extract was stored at 4°C until further use.

Test organisms:

Bacillus pumillus, Salmonella typhi, Bacillus subtilis, Escherichia coli, Staphylococcus aureus, Pseudomonas aureginosa, Fungal strains such as Candida albicans

Antimicrobial activity assessment:
The aqueous extracts of Alternanthera sessilis was evaluated for antibacterial activity and antifungal activity using agar well diffusion method.

Antibacterial activity of Althernanthera sessilis

Table 3:

ORGANISM	ALTHERNANTHERA SESSILIS	
	ACTIVITY	ZONE OF INHIBITION
Bacillus pumillis	Positive	12
Salmonella typhi	Positive	12
Bacillus subtilis	Positive	10
Escherechia coli	Nil	-
Staphalococcus aureus	Nil	-
Pseudomonas auriginosa	Nil	-

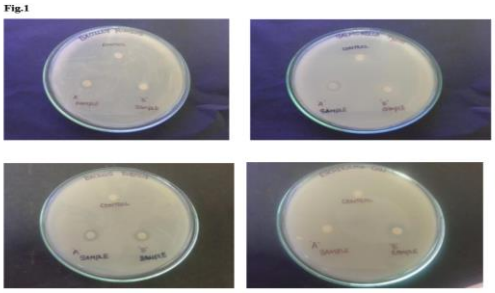


Figure: 2

Antifungal activity of Althernanthera sessilis:
Table: 4

S.N	ORGANISM	ALTHERNANTHERA SESSILIS
1.	Aspergillus niger	Nil
2.	Candida albicans	Nil

Figure: 3

CONCLUSION
The aqueous extracts Alternanthera sessilis showed good antibacterial activity against gram positive and gram negative organisms. It suggests the usefulness of the plants against antimicrobial activity. So it is anticipated that Alternanthera would be useful to treat diseases. This investigation may lead to the development of natural antimicrobial agents.**[4]**

1. NUTRITIVE VALUE:

Collection and preparation of sample
Leaves of Alternanthera sessilis were harvested. The leaves were washed and dried to avoid destroying active compounds. Dried leaves were ground to homogenous powder using willwy mill grinder and stored in air tight container. Sample was subjected to biochemical analysis.

Biochemical Analysis
Biochemical analysis were carried out to find total Carbohydrate, Starch, Protein, Aminoacid, Vitamin B1 and Vitamin B2 according to the procedure of Association of Official Analytical Chemist (Sadasivam and Manickam, 1992. The cooking quality was analyzed for total Carbohydrate, Starch and Proteins

Results and Discussion
The biochemical composition of Alternanthera sessilis leaves based on cooking time interval of 0 min, 5min, 10min and 15min (Table 2 and Chart 1) revealed that there was a gradual decrease in the composition of Carbohydrate and Starch. The composition of proteins remained approximately the same. Hence Alternanthera sessilis leaves can be recommended to be cooked in an average of 5–10 min. **[5]**

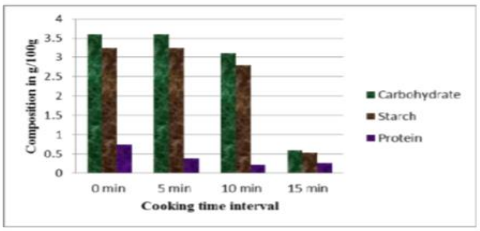


Chart 1: Chart showing Biochemical composition of *Alternanthera sessilis* (L.) R.Br. ex DC. leaf based on different cooking time intervals. (g/100gm)

Figure: 4

Table:5

Table 2: Change in Biochemical composition of *Alternanthera sessilis* (L.) R.Br. ex DC. leaf based on different cooking time intervals (g/100gm)

Parametres	Different cooking time intervals g/100g			
	0 min	5 min	10 min	15 min
Carbohydrate	3.60	3.60	3.10	0.60
Starch	3.24	3.24	2.79	0.54
Protein	0.740	0.375	0.210	0.260

1.CHARACTERIZATION OF THE BIOSYNTHESIZED SILVER NANOPARTICLES OF ALTERNANTHERA SESSILIS (LINN.):

Materials and Methods:

Experimental animal: Healthy male Wistar albino rats (150 - 200 gm)

Plant: Alternanthera sessilis (Linn.)

Drugs and chemicals:

95 % Ethanol, Silver nitrate (3Mm), Rotenone, Syndopa

Preparation of A. sessilis (Linn.) Silver Nanoparticles

Sillver nitrate (3 mM) solution was prepared:

The plant extract (20ml) + silver nitrate solution (80 ml).

↓

Colour change from yellow to reddish brown indicated silver nanoparticles formation.

These were then purified by repetitive centrifugation for 10 min at 7000 rpm. Finally the pellets were collected and dried. The chemical tests were carried out in ASNPs for vitamin C and proteins.

UV spectrum analysis: Silver ions reduction was confirmed by measuring UV spectrum of reaction mixture. Distilled water was used as blank. The UV analysis was done by double beam spectrophotometer, Shimadzu 1800, at resolution 1 nm from 250 to 450 nm.

SEM analysis: FE-SEM (JEOL JSM 3600) was used to do the Morphological characterization of the samples. A small amount of dried sample was coated on the carbon tape. It was again coated with platinum then the material was subjected to analysis.

RESULTS:

UV–vis Spectra Analysis:

Extracts from whole plants under study showed rapid conversion of silver nitrate into silver nanoparticles indicated by colour change within few minutes of addition of extract in 3mM AgNO3 solution, from pale yellow to red-brown. The spectrum showed a maximum absorption in range between 420 - 450 nm.[6]

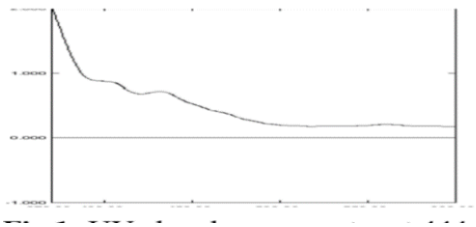


Figure: 5

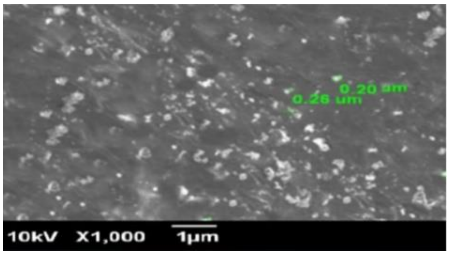


Figure:6

Scanning electron microscopy:

The study of characterization of ASNPs, revealed sperical shape of nanoparticles.

1. ANTIOXIDANT PROPERTY USING YEAST MODEL SYSTEM

Materials and methods:

Yeast sample collection:

Yeast sample was collected from sugar factory effluent. Sample was collected in sterile plastic botteles and brought to laboratory.

Plant collection:

Fresh leaves of A.sessilis leaves were used to eastimate all parameters. They were washed free of contaminations under running tap water and blotted dry between the folds of soft tissue paper.

Extract preparation:

The leaves were washed free of surface contamination with tap water, rinsed with distilled water and blotted gently with filter paper. 1g of fresh leave was homogenized and the residues were percolated the different solvents (Methanol, Ethanol and Water) in 5ml. The homogenates were centrifuged at 2000 rpm for 5 minutes and the supernatant was used.

Isolation of the Yeast:

The sample was serially diluted using sterile saline. The sample was mixed thoroughly and streaked on the YPD agar plates then incubated at 37°C in an incubator in inverted position.

Duplicates were maintained for 2 days incubation and the plates were examined for colonies formation. A single colony from a plate was picked out and it was sub cultured in YPD broth and it was used for further studies.

Genomic DNA of the yeast cell was isolated and visualized and photographed using an Alpha Digidoc digital gel documentation system.

Rapid Screening of Antioxidant Activity

Dot Plot Assay: Aliquots (3µl) of A. sessilis extracts were spotted on a TLC plate and allowed to dry. The TLC plate bearing the dry spots was placed upside down for 10 seconds in the solution of DPPH. The spots exhibiting radical scavenging, antioxidant activity showed up as yellow spots in a violet background. The intensity of the yellow colour depends on the amount and nature of the radical scavenger present in the spot.

DPPH Photometric Assay: An exact amount(0.5ml) of the methanol solution of DPPH was added with 20 µl of the leaf extracts in the different solvents and the crude aqueous extract (corresponding to 4mg) and 0.48ml of methanol and allowed to standard room temperature for 30 minutes. Methanol served as the blank. After 30 minutes, the absorbance was measured at 518nm and converted into percentage radical scavenging activity as follows:

$$\textbf{Scavenging activity (\%)} = \frac{A\,[sample] A\,[blank]}{A\,[blank]} \times 100$$

RESULTS

Rapid Screening of Antioxidant Activity

Dot Plot Assay:

A. sessilis leaf extract showed the DPPH scavenging activity in aqueous extract, followed by ethanol and methanol extract. [7]

Figure:7

Table:6

S.NO	TEST COMPONENTS	INHIBITION %
		Althernanthera sessile
1.	Menthol Extract	33.44
2.	Ethanol Extract	48.30
3.	Aqueous Extract	68.04

1. Phytochemical screening and quantitative analysis:

Plant:

Alternanthera sessile

Preparation of the Plant extracts:

Fresh leaves of A.sessilis were separated, washed and shade dried for about 10 days. These dried leaves were ground to coarse powder using mechanical grinder. The dried leaves were subjected to sequential extraction using ethanol, ethyl acetate, hexane and water by Soxhlet extraction method using standard procedures. The grounded powder was dissolved using distilled water and filtered and used as an aqueous extract. The extracts obtained using solvents were concentrated using rotary vacuum evaporator and then dried. The collected extracts were stored and then taken up for further investigations. The resulted filtrate was used for both qualitative and quantitative phytochemical analysis.

Qualitative Phytochemical Activity Screening

Test for carbohydrates: The presence of carbohydrates was confirmed when 2ml of plant extract was treated with 1ml of Molisch's reagent and few drops of concentrated sulphuric acid resulted in the formation of purple or reddish color.

Test for tannins: To 1ml of plant extract, 2ml of 5% ferric chloride was added. Formation of dark blue or greenish black indicates the presence of tannins

Test for saponins: 2ml of plant extract, 2ml of distilled water were added and shaken in a graduated cylinder for 15minutes lengthwise. It resulted in the formation of 1cm layer of foam indicated the presence of saponins

Test for flavonoids: To 2ml of plant extract, 1ml of 2N sodium hydroxide was added. Presence of yellow color indicates the presence of flavonoids

Test for alkaloids: To 2ml of plant extract, 2ml of concentrated hydrochloric acid was added. Then few drops of Mayer's reagent were added. Presence of green color or white precipitate indicates the presence of alkaloids

Test for quinones: To 1ml of extract, 1ml of concentrated sulphuric acid was added. Formation of red color indicates presence of quinones

Test for glycosides: To 2ml of plant extract, 3ml of chloroform and 10% ammonia solution was added. Formation of pink color indicates presence of glycosides.

Test for Cardiac Glycosides: To 0.5 ml of the extract, 2ml of glacial acetic acid and few drops of ferric chloride were added. This was under layered with 1ml of Conc. Sulphuric acid. Formation of brown ring at the interface indicates the presence of cardiac glycosides

Test for terpenoids: 0.5ml of the extract was treated with 2ml of Chloroform and conc. Sulphuric acid. Formation of red brown colour at the interface indicates the presence of terpenoids

Test for phenols: 2ml of distilled water followed by few drops of 10% ferric chloride was added to 1ml of the extract. Formation of blue or green color indicates presence of phenols

Steroids and phytosteroids: To 1ml of plant extract equal volume of chloroform is added and subjected with few drops of concentrated sulphuric acid appearance of brown ring indicates the presence of steroids and appearance of bluish brown ring indicates the presence of phytosteroids.

Anthraquinones: To 1ml of plant extract few drops of 10% ammonia solution was added, appearance pink color precipitate indicates the presence of anthraquinones.

Test for Coumarins: 1ml of 10% Sodium hydroxide was added to 1ml of the extract. Formation of yellow colour indicates the presence of coumarins

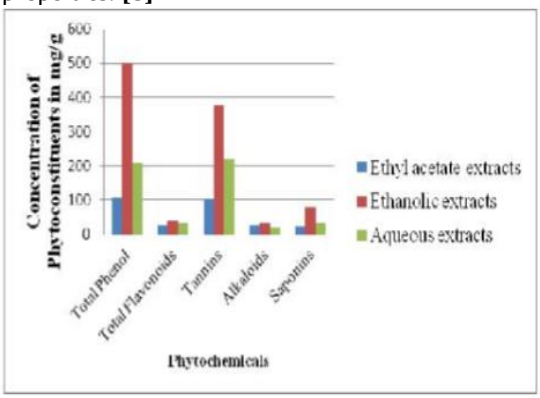
Ninhydrin Test: To 2ml of the plant extract few drops of 0.2% Ninhydrin reagent was added & heated for 5 minutes. Formation of blue colour indicates the presence of aminoacids

Test for Phlobatannins: Few drops of 2% Hydrochloric acid was added to 1ml of the extract. Appearance of red colour precipitate indicates the presence of phlobatannins.
Table: 6

Table 1: Result of Preliminary Phytochemical screening for the different extracts of the leaves of *Alternanthera sessilis*

S. No.	Tests Parameters	Hexane Extract	Ethyl Acetate Extract	Ethanol Extract	Aqueous Extract
1	Alkaloids	+	+	+	+
2	Terpenoids	-	-	+	+
3	Glycosides	-	-	+	+
4	Flavonoids	-	+	+	+
5	Tannins	+	+	+	+
6	Saponins	+	+	+	+
7	Quinones	-	-	-	-
8	Phenol	-	+	+	+
9	Cardiac Glycosides	-	_	+	-
10	Coumarins	+	-	+	+
11	Steroids	-	-	+	-
12	Anthroquinones	-	-	-	-
13	Aminoacids	-	-	-	-
14	Carbohydrates	+	-	+	+
15	Phlobatannins	-	-	-	-

CONCLUSION:
A.sessilis contains bioactive components especially in ethanolic extract of the leaves. Different phytochemicals have been found to possess a wide range of activities, which may help in protection against chronic diseases. For example, alkaloids protect against chronic diseases. Saponins protect against hypercholesterolemia and antibiotic properties. Steroids and triterpenoids show the analgesic properties. **[8]**



1. INVITRO PROPAGATION METHODS AND MATERIALS:

Source of explant:

Plants of A.sessile

Surface Steralization of Explant:

Internode portion was collected and washed thouroughly under tap water then treated with tween followed by distilled water. Surface sterilization of explant was done by $HgCl_2$.

Callus Culture and Shoot Bud Induction: Murashige and Skoog medium was used for in vitro culture of A.sessilis. Culture medium was sterilized in autoclave. For callus induction MS medium was supplemented. After callus induction, calli were taken out aseptically, cut into small sections and inoculated onto MS medium.

Rooting of Shoots:

The shoots were isolated from callus and cultured in half strength MS basal medium.

Hardening andinVivo Transfer ofin VitroGrown Plants:

Sufficiently rooted plantlets were removed from medium and root portions were carefully washed with distilled water to remove the media adhering to roots. For hardening in vitro regenerated plantlets were first cultured in distilled water for one week in incubation room without plugging the cultured test tube. After one week plants these were transplanted in earthen pots containing soil and cow dung in ratio 3:1 and maintained in agro net house for one week and finally transferred to field condition. In vitro raised plants were irrigated regularly with 10ml of tap water.

CultureCondition:

All the cultures were
Incubated at 25ºC temperature,
65-70% humidity
Under white light at intensity of 2000 lux

RESULT:

This experiment established that in vitro root induction from shoot of A. sessilis can be achieved in hormone free half strength MS medium. Root induction was recorded on second day of incubation of shoots on half strength MS basal medium. Root length of shoots cultured onto half strength MS basal medium was found maximum (7.49cm) as compared to other treatments. **[9]**

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