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PREPARATION, STANDARDIZATION AND EFFECT OF KUNAPAJALA IN CONSERVATIVE CULTIVATION OF USHEERA - A COMPARATIVE ANALYSIS

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ABSTRACT

Ancient India has given us a treasure of Vrikshayurveda which if utilized wisely can be a boon to our society. Looking at the pathetic malpractices of modern agriculture and the haphazard use of chemical pesticides and fertilizers it is the need of time today to bring it back as a part of good agriculture practices. Vrikshayurveda provides us with enough resources regarding different types of cultivation techniques and the use of manures. Kunapajala is one such liquid manure mentioned in Vrikshayurveda which is claimed to increase the yield of a crop apart from having pesticide effects without altering the medicinal properties of the plants. This article aims at assessing the qualitative and quantitative analysis of Usheera roots.

Keywords: analysis, chemical fertilizers, cultivation techniques, kunapajala, pesticides, vrikshayurveda

INTRODUCTION

The unavailability of original plants and adulteration are the major lacunas in the research and development of Ayurvedic drugs. It's high time that we focus on good Agriculture practices mentioned in our ancient texts. So as to make Ayurvedic drugs more rational and reliable. The use of chemical pesticides and fertilizers in modern agriculture practices has taken a heavy toll on our health. So, we have to find out alternate cultivation methods and nothing can be better than Vrikshayurveda.

Kunapajala being a nourishment agent acting as a catalyst in the growth and development of plant parts has proved to be extremely efficient manure in this study. This study has been carried out on Usheera (*Vetiveria zizanioides*) medicinal plant **[1]**. Usheera is described in Kaushik sutra, Yaajnavalkya smriti and other contemporary texts repeatedly. In Charak Samhita it is described as Varnya, Trishnanigrahan, krimighna. *Vetiveria zizanioides* Linn. is a perennial grass of poaceae family, it's a very famous Ayurvedic drug and is widely used in ayurvedic medicines and for deriving its high value essential oil as it is commonly used in cosmetic and perfume industries **[2]**.

Drug Review [3]:

Habitat

Usheera mainly grows in aquatic region that is found along the margins of ponds, ditches, lakesand rivers of tropical India. It is found in south India, Bengal, Rajasthan, Nagpur **[4, 5]**. It is also found in Haryana, Uttar Pradesh, Madhya Pradesh, Assam, Odisa, Rohtak, Gujarat, Rajasthan.

Morphology

- **Stems:** Culms arising from an aromatic rhizome, stout, up to and over 2m tall in dense tufts, with stoutspongy aromatic roots. Culms usually sheathed.
- **Leaves**: Leaf blades are acute at apex, it is narrow, erect, linear, glabrous.
- **Inflorescence**: A panicle of numerous slender raceme, in green or purplish colour, sessile spike lets, lemma of lower floret as long as glumes; acute.
- **Fruits:** Oblong, grains slightly oblique at the apex. Flowering and fruiting occur throughout the year.

Useful Part

- Moola (Roots).
- The root is usually cooling, bitter, alexiteric, stomachic, astringent, useful in burning sensation, bilious fever, sweat, fowl breathe thirst, disease of blood (Ayurveda). It is also cooling to brain, bitter, soporific, useful in spermatorrhea, head ache, disease of blood

(Unani). An infusion of root is given asa febrifuge and a powder in bilious complaints. The essence is used as tonic. A paste of pulverized root in water is also used as a cooling external application in fever. The root is also useful in making mats, hand fans, baskets etc. The commercial oil is also obtained by distillation of fresh/air dried roots.

Aim:

- To study the effect of Kunapjala in cultivation of Usheera W.S.R to Vrikshayurved.

Objectives:

- To critically study the conventional and special cultivation techniques of *Vetiveria zizaniodes* W.S.R to Vrikshayurved
- To assess the efficacy of kunnapajala in improving the physical and phytochemical qualities of roots of *Vetiveria zizanioides* by comparing with the conventional cultivation method.

MATERIALS AND METHODS

Site of Study:

- This study was carried out at the Botanical Garden of Parul Institute of Ayurveda and Research, Parul University, Vadodara, Gujarat for a period of 18 months i.e from February 2020 to October 2021.

Sample Size:

- 60 samples of Usheera flips were selected for the study and divided into two groups. i.e 30 in Group A and 30 in Group B.

Grouping:

- The whole cultivation study was divided into two groups i.e. Group A & Group B. Group A treated with Kunapajala and Group B treated with normal water and fertilizer.
- 30 samples of Usheera flips were selected for each group.

Method of Preparation (KJ) [6]: (as per standard protocol)

- Fish, Mutton (1.5 kg each) will be boiled in 12 liters of water, until the meat juice of 6 liters was obtained.
- Then it is cooled, this meat juice was equally divided into three porcelain jars of (5 litres) capacity and added with ingredients to each fumigated porcelain jar, 2 l of meat juice, 2 l of milk was added, followed by addition of 833 g of Honey and 167 g of Tila (*Sesamum indicum* L.) and Masha (*Vigna mungo*) each.
- Then all the three jars mouth was covered with lids, and sealed with

mud smeared cloth for anaerobic fermentation.

- After completion of fermentation i.e. 15 days, the jars were opened by removal of mud smeared cloth and the liquid was filtered through clean cloth and stored in air tight glass bottles. Further, the liquid was kept for settling for few days; again, decanted through cotton cloth to remove the solid contents.

Images of Kunapjala Preparation and Storage:

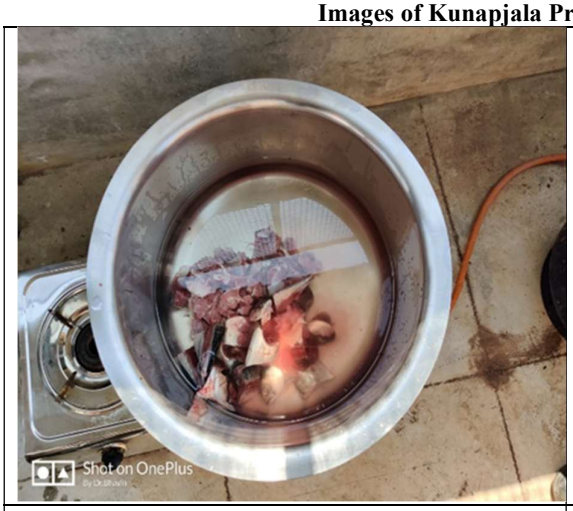


Figure 1: fish, chicken being boiled in water

Figure 2: Adding of other ingredients to make decoction

Figure 3: The prepared decoction is sealed in plastic container

Methods [7]:

- Usheeraa was grown in grow bags in the Botanical garden of the Parul Institute of Ayurved and Research, Parul University, Vadodara, Gujarat.
- Kunapajala was prepared mentioned in Surpala Nighantu.

- A group was treated with 50ml of Kunapajala at an interval of one month and irrigation was done daily. B group was irrigated with water daily and Organic cow dung fertilizer was applied once a month for 18 months.
- The crops of both groups were harvested in the 1st week of September 2021.
- Soil samples were tested before and after the cultivation study at B. A college of Agriculture, Department of Agricultural Chemistry and Soil Science, Anand Agriculture University, Anand, Gujarat.
- Ten plants of Usheera from each group were selected randomly for qualitative and quantitative analysis.
- A sample of the root had been sent to the School of Pharmacy, Parul University, Vadodara, Gujarat for Qualitative and Quantitative analysis.
- A sample of the root had been sent to Vasu Healthcare Pvt. Ltd, Makarpura G.I.D.C, Vadodara, Gujarat for HPTLC analysis.

Images of Kunapjala treatment & harvesting of Usheera:

Figure 4: Administering Kunapajala to saplings

Figure 5: The saplings being irrigated with Kunapajala

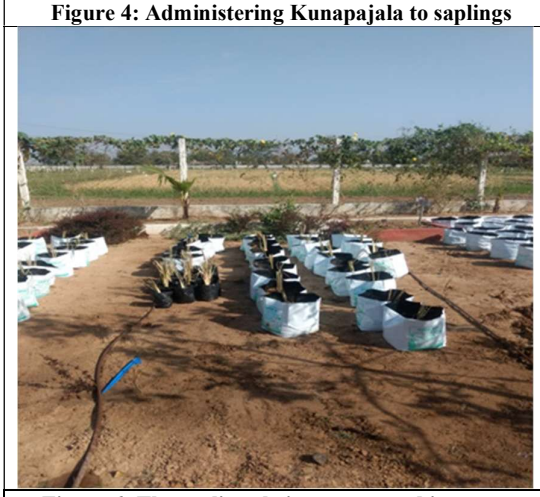


Figure 6: The saplings being segregated in groups

Figure 7: The measurement of growth in saplings

Figure 8: Monitoring the growth of saplings in every 15 days

Figure 9: Harvesting

Figure 10: Harvesting

Figure 11: Weight being recorded after harvesting

RESULT AND DISCUSSION

1) Growth:

On the basis of Growth chart the maximum values for plant height were recorded in the group A which was treated with Kunapajala and the minimum in the control group i.e group B which was not given Kunapajala.

2) Soil Analysis

Soil analysis before and after cultivation had been done from the Department Of Agriculture Chemistry And Soil Science, B.A College of Agricultural University, Anand, Gujarat.

a) Soil analysis before cultivation-

- Organic carbon -0.27%
- Available Phosphorus-13.24kg/ha
- Available Potassium-168kg/ha
- SoilpH-8.36
- Soil EC-0.36(dSm-1)

b) Soil analysis after cultivation-

Group A-Usheera with Kunapajala

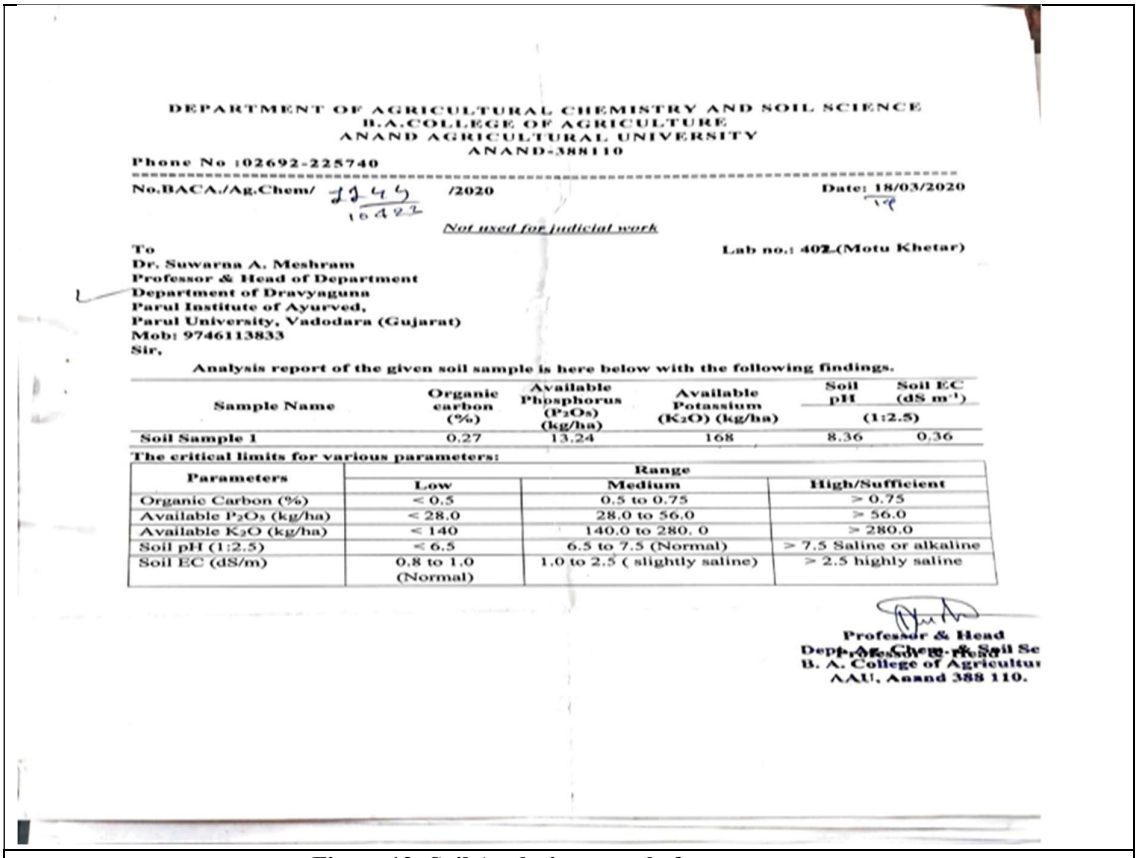
- Organic carbon -0.59%
- Available Phosphorus-25.96 kg/ha
- Available Potassium-164 kg/ha
- SoilpH-8.79
- Soil EC-0.28(dSm-1)

Group B-Usheera without Kunapajala

- Organic carbon -0.47%
- Available Phosphorus-6.35 kg/ha
- Available Potassium-108kg/ha
- SoilpH-9.08
- Soil EC-0.31(dSm-1)

It is observed that Organic carbon in Kunapajala treated group A (0.59%) increased by 0.3 % as compared to without Kunapajala group B (0.27%). Phosphorus also was seen to be increased by 13 kg/ha in Kunapajala treated group A (25.96kg/ha) as compared to without Kunapajala group B (13.24kg/ha). The available Potassium was found to be 60 kg/ha more in Kunapajala treated group A (168 kg/ha) as compared to without Kunapajala group B (108 kg/ha). The soil pH of the Kunapajala treated group (8.79) however increased by 0.4 as compared to value (8.36) done before cultivation.

A) Soil Analysis report before treatment:



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To
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Mob: 9746113833

Lab no.: 402 (Motu Khetar)

Sir,

Analysis report of the given soil sample is here below with the following findings.

Sample Name	Organic carbon (%)	Available Phosphorus (P_2O_5) (kg/ha)	Available Potassium (K_2O) (kg/ha)	Soil pH (1:2.5)	Soil EC (dS m^{-1}) (1:2.5)
Soil Sample 1	0.27	13.24	168	8.36	0.36

The critical limits for various parameters:

Parameters	Range		
	Low	Medium	High/Sufficient
Organic Carbon (%)	< 0.5	0.5 to 0.75	> 0.75
Available P_2O_5 (kg/ha)	< 28.0	28.0 to 56.0	> 56.0
Available K_2O (kg/ha)	< 140	140.0 to 280. 0	> 280.0
Soil pH (1:2.5)	< 6.5	6.5 to 7.5 (Normal)	> 7.5 Saline or alkaline
Soil EC (dS/m)	0.8 to 1.0 (Normal)	1.0 to 2.5 (slightly saline)	> 2.5 highly saline

Professor & Head
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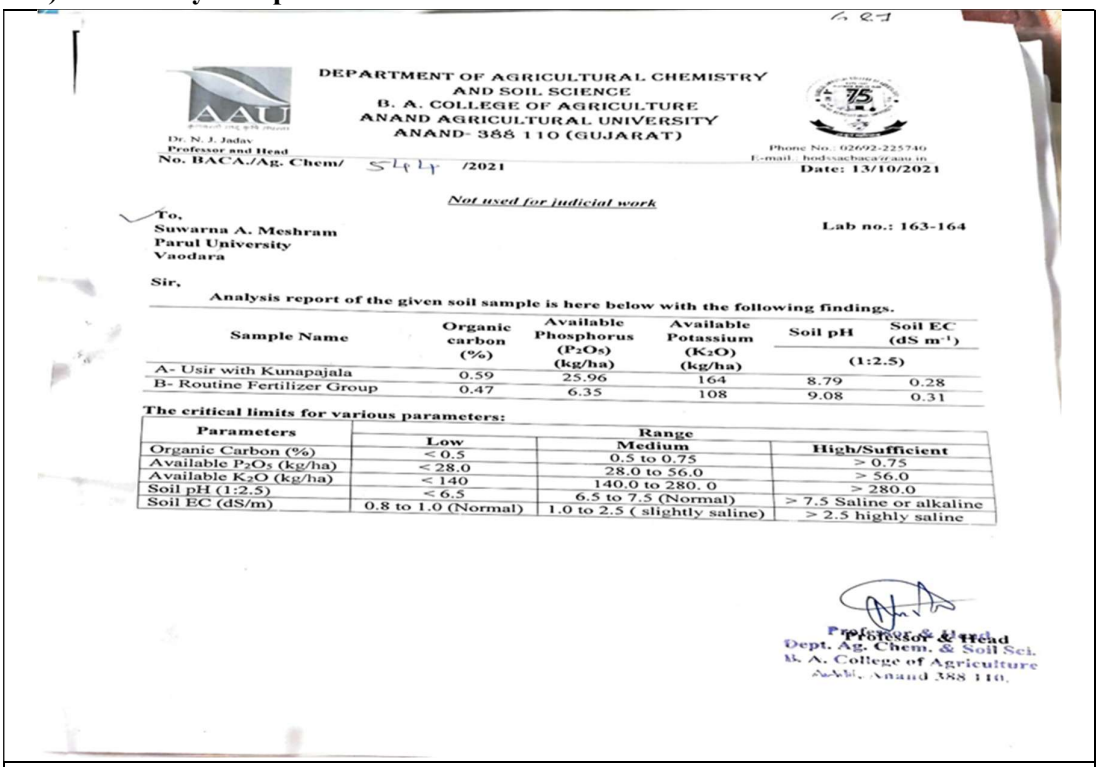
AAU, Anand 388 110.

Figure 12: Soil Analysis report before treatment

B) Soil Analysis report after treatment



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To,
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Parul University
Vaodara

Lab no.: 163-164

Sir,

Analysis report of the given soil sample is here below with the following findings.

Sample Name	Organic carbon (%)	Available Phosphorus (P_2O_5) (kg/ha)	Available Potassium (K_2O) (kg/ha)	Soil pH (1:2.5)	Soil EC (dS m^{-1})
A- Usir with Kunapajala	0.59	25.96	164	8.79	0.28
B- Routine Fertilizer Group	0.47	6.35	108	9.08	0.31

The critical limits for various parameters:

Parameters	Range		
	Low	Medium	High/Sufficient
Organic Carbon (%)	< 0.5	0.5 to 0.75	> 0.75
Available P_2O_5 (kg/ha)	< 28.0	28.0 to 56.0	> 56.0
Available K_2O (kg/ha)	< 140	140.0 to 280. 0	> 280.0
Soil pH (1:2.5)	< 6.5	6.5 to 7.5 (Normal)	> 7.5 Saline or alkaline
Soil EC (dS/m)	0.8 to 1.0 (Normal)	1.0 to 2.5 (slightly saline)	> 2.5 highly saline

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Figure 13: Soil Analysis report after treatment

3) Phytochemical analysis of roots and powder:

The screening analysis was performed in order to identify various secondary metabolites, which are present in *Vetiveria zizanoides* without Kunapajala i.e Sample A and *Vetiveria zizanioides* with kunapajala i.e Sample B given in **Table 1**.

Sl. No.	Phytochemicals	Sample A w/w% (Control Group) Without Kunapajala	Sample B w/w% (Trial Group) With Kunapajala
1.	Total Phenolics	15.75	16.28
2.	Alkaloids	1.92	2.47
3.	Saponins	0.30	1.2
4.	Flavonoids	8.74	8.95

The screening analysis of *Vetiveria zizanioides* using various solvents revealed the presence of carbohydrates, proteins, alkaloids, tannins and phenols in ethanolic and aqueous extracts. The qualitative phytochemical analysis results explored the presence of a wide range of phytochemical constituents which signifies the *Vetiveria zizanioides* of Sample A is a valuable therapeutic natural source but *Vetiveria zizanioides* with kunapajala Sample B is having a higher amount of active constituents which will serve as an effective herbal option to combat dreadful infectious diseases.

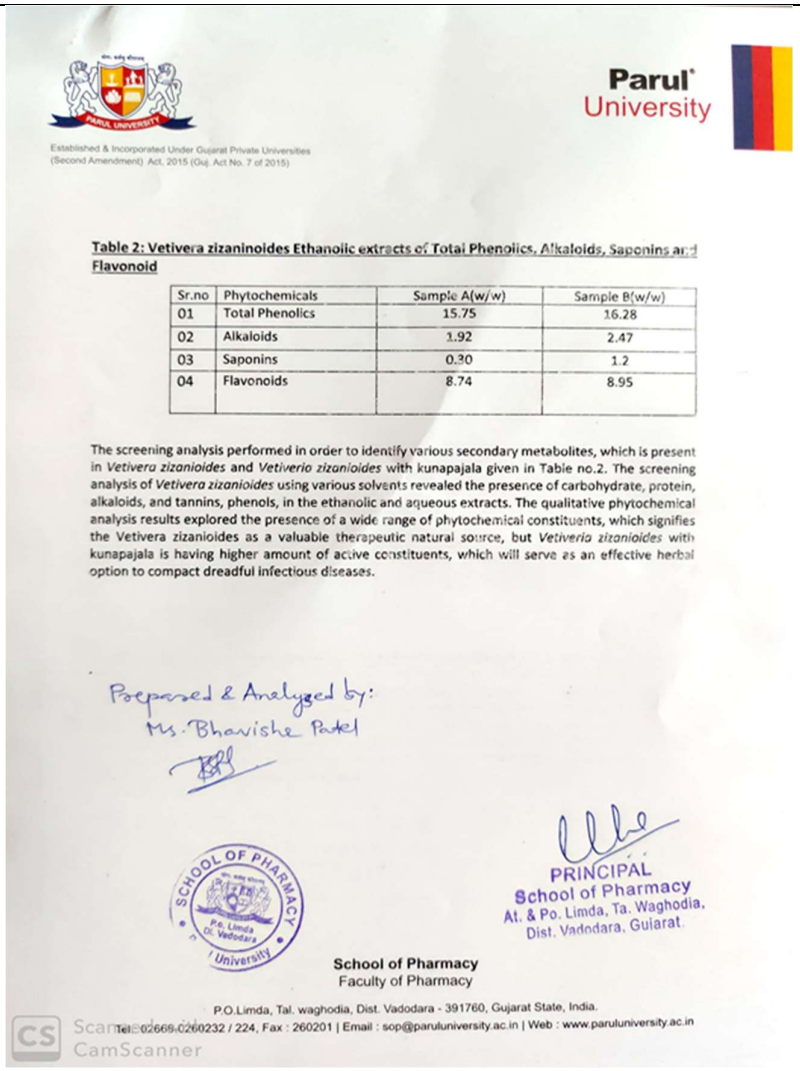

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Table 2: Vetivera zizaninoides Ethanoiic extracts of Total Phenolics, Alkaloids, Saponins and Flavonoid

Sr.no	Phytochemicals	Sample A(w/w)	Sample B(w/w)
01	Total Phenolics	15.75	16.28
02	Alkaloids	1.92	2.47
03	Saponins	0.30	1.2
04	Flavonoids	8.74	8.95

The screening analysis performed in order to identify various secondary metabolites, which is present in *Vetivera zizanioides* and *Vetiverio zizanioides* with kunapajala given in Table no.2. The screening analysis of *Vetivera zizanioides* using various solvents revealed the presence of carbohydrate, protein, alkaloids, and tannins, phenols, in the ethanolic and aqueous extracts. The qualitative phytochemical analysis results explored the presence of a wide range of phytochemical constituents, which signifies the Vetivera zizanioides as a valuable therapeutic natural source, but *Vetiveria zizanioides* with kunapajala is having higher amount of active constituents, which will serve as an effective herbal option to compact dreadful infectious diseases.

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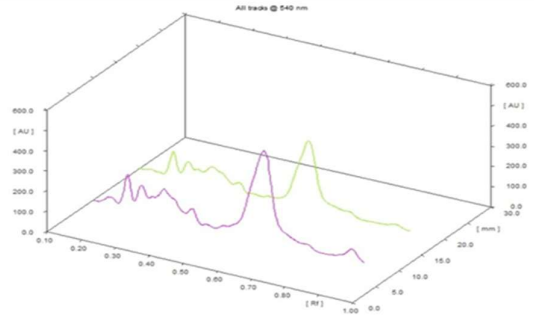
CamScanner

Figure 14: *Vetiveria zizanioides* ethanolic extracts of Phenolics, Alkaloids, Saponins and Flavonoid

4) HPTLC Analysis – HPTLC was done from Vasu Pharma & Research centre to compare the Phytochemicals of both the samples of Usheera Root. Chromatograms of both the samples shows more Phytochemical components in sample treated with Kunapajala. Total number of Peaks, Peaks area and Rf values are more in Kunapajala treated sample compared to when compared to normal water and fertilizer group. This shows highly significant result of Kunapajala treated Usheera at 540 nm HPTLC chromatogram.

VASU

HPTLC Chromatogram @ 540 nm



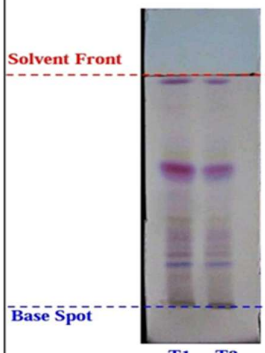
3D chromatogram

R_f value

Spot No.	Track T1	Track T2
1	0.13	-
2	0.18	0.18
3	0.22	0.22
4	0.31	0.31
5	0.40	0.40
6	0.47	0.47
7	0.60	0.60
7	0.72	0.72
8	0.85	0.85

Track T1 : Ushira (Group-A: With Kunapjala)
Track T2 : Ushira (Group-B: Without Kunapjala)

HPTLC Plate



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Designation	Officer	Dy. Manager	Sr. Manager
Signature			

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Figure 15: HPTLC Analysis

CONCLUSION

Conclusion has been made on the basis of analysis reports and discussion regarding height, soil analysis reports, phytochemical reports and HPTLC reports.

1. The increase in height of Usheera plant is observed more in Kunapajala treated group when compared to normal water and fertilizer group.
2. Soil reports are showing more fertility in Kunapajala treated group after the harvesting of Usheera.
3. The screening analysis of *Vetiveria zizanioides* using various solvents revealed the presence of more carbohydrates, proteins, alkaloids, tannins and phenols in ethanolic and aqueous extracts in Kunapajala

treated sample when compared to normal water and fertilizer group.

4. HPTLC chromatogram showed that Kunapajala treated Usheera is having more Phytochemicals.

The result of the present study indicated that plant height, and fresh and dry biomass yield of roots were recorded as high in Kunapajala treated plants also early and healthy flowering was observed in the trial group. The application of Kunapajala overall boosted crop productivity. Since Kunapajala is prepared out of organic materials, it can be considered safe and environmentally friendly which would not interfere with the medicinal properties of the crop. Therefore, the inclusion of such organic manures in agriculture practices should be encouraged to improve the efficacy and availability of medicinal plants and to alleviate adverse effects of chemical pesticides and fertilizers which in turn also affect the quality of the soil. It can be concluded that the cultivation of Usheera increases the fertility of the soil. Endangered and Threatened species of medicinal plants can be propagated by such age-old traditional techniques.

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