Research Article

Comparative study of quantitative evaluation of Patol (*Trichosanthes anguina* L) cultivated by Vrukshayurveda and Conventional cultivation practice

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Abstract:

Now-a-days the quality of the medicinal plants are highly affected due to the abundant use of chemicals fertilizers and pesticides for the purpose of obtaining high yields. But such modern techniques are found to compromise the natural medicinal value of the plant. Also these chemical fertilizers and pesticides used for protection of the plants has got various hazardous effects on the heath. Thus there is a crucial need of switching over to organic means of agriculture for saving the natural properties of the plants. *Vrukshayurveda* being the science of plants life, includes a detailed study regarding various afforestation techniques, cultivation and harvesting methods, collection and conservation of plants and treatments of the plants based on the ayurvedic Siddhant. *Patol* is a widely used dravya in the Ayurveda having a very wide range of therapeutic usage. Thus owing to its high demand and to provide a good quality and inexhaustible supply of the plant the topic has been selected as an initiative towards the natural cultivation of medicinal plants instead of opting for the inorganic, chemical mixed ways of cultivation to ensure an improved medicinal potency of the plants naturally. In this study two methods of cultivation has been used (conventional and vrukshayurveda) and their comparision has been done in terms of the quantitative results.

Key Words: *Vrukshayurveda*, *Patol*,cultivation

Introduction:

Many of the useful medicinal plants are on the verge of extinction due to their high demand and low cultivation rates. In order to meet the large demands and supply of the medicinal plants in the market for the pharmaceutical companies, Ayurved practitioners etc, adulteration of medicinal plants takes place on a very large scale. Adulteration impairs the product quality, authenticity, purity and pharmacological action of the drug thereby showing poor results in the treatment. Thus there is a critical need for the preservation and conservation of the medicinal Plants specially the endangered ones. Various biotechnological and inorganic farming techniques are working on various measures by which the problem can be solved. But these modern methods does not meet these demands completely since it has got its own unavoidable hazards and drawbacks. However there is crucial need for adapting the natural ways of cultivation which will secure the plants natural value without any harm to the ecosystem. Both these aims can be achieved by incorporating the natural means of cultivation. It can not only safeguard the original natural constituents of the plants but also shall help us to grow the plants in natural eco-systems. On this grounds *Vrukshayurveda* being completely natural can be taken into consideration.

Aim: To compare the qualitative and quantitative evaluation of Patol (*Trichosanthes anguina.*L) cultivated by *Vrukshayurveda* and Conventional cultivation practice.

Objectives:

1. Cultivation of Patol (*Trichosanthes anguina* L.) by Vrukshayurveda method.
2. Cultivation of Patol (*Trichosanthes anguina* L.) by conventional method.
3. Qualitative and Quantitative analysis of Patol (*Trichosanthes anguina* L.) by Vrukshayurveda cultivation method.
4. Qualitative and Quantitative analysis of Patol (*Trichosanthes anguina* L.) by conventional method.

Literature for the study –

Patol: falgune maasi trunanalkaraalita !

Chaitre falanti sansikta: sandhitai: Khalikajalai: !! 157!! Surpal Vrukshayurved

(As per the Expert"s interpretation) It means that for the cultivation of *Patol* (*Trichosanthes anguina* L.) seeds should be treated with dry grass ash in the month of *Phalguna* (approx. February and March) by rubbing the seeds in the dry grass between both the hands and the plant should be sprinkled with sesame oilcake water in the month of *Chaitra* (approx. March and April).

Uptam Pushpacharya keernateelaprakhadya vaahite!

Bhu pradeshe same ramya vrukshanam ropyetvapet!! Surpaal Vrukshayurved 63

It means that the soil should be cultivated with *Til* and when the flowering occurs, the *Til*plants should be uprooted and smashed in the same soil.

Ropayet kaddalikaadi sudhirveshak- hashukrayo: !! Surpaal Vrukshayurved-89

It means that the plants like *Patol* etc. should be cultivated in the month of *Phalguna* (approx. February and March).

Location of study -

Institution's garden**.** An area of 12 meters × 8 meters land was selected for cultivation of *Patol*.

Type of study - Experimental study

Materials:

1. Soil
2. Seeds of Patol (*Trichosanthes anguina* L.)
3. Sesame oil cakes (used as compost material)
4. Dry grass ash (used for the preparation of seeds)
5. Cow dung ash
6. *Ishtika choorna*
7. Tila seeds (used for the preparation of the soil)
8. Water for irrigation as per the requirement
9. Farming instruments – spade, axe, khurapni, hand cultivator, grab hoe, containers, pipe.
10. Seedling tray
11. Cocopit

Methodology:

In this study cultivation of Patol *(Trichosanthes anguina*L.*)* was done in two methods –

1. *Vrukshayurveda* Method
2. Conventional Method

Further **3 groups** was made with each group having **5 plants**.

- Group A - Group B - Group C

Plants in Group A and Group B was cultivated by two different methods mentioned in *Vrukshayurveda*.

Plants in Group C was cultivated by conventional method.

The following steps were carried out for the study -

1. Soil preparation
2. Collection and preparation of Patol (*Trichosanthes anguina*L.) seeds.
3. Sowing of seeds of Patol (*Trichosanthes anguina* L.)
4. Composting
5. Irrigation
6. Harvesting

1. Soil Preparation (as per the reference in *Surapala's Vrikshayurved*)[1]

Figure No. 1: Field Preparation for cultivation

Tila Seeds were collected from local market in the month of July. They were sown in the soil in August and on the arrival of flowering the crops were uprooted in the month of November and mixed in the soil. The soil was then kept steady for further cultivation.

Soil allotment among the groups –

GROUP A and GROUP B - Til processed soil, GROUP C - Unprocessed soil

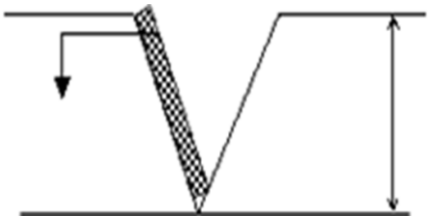
2. Field Preparation for cultivation**:**

Three separate pit sections were made on the field for each group.

Soil testing: The samples of Unprocessed and processed soil were tested from a renowned institute. The Soil sample was collected in the following way –

- **Step 1 –** Sampling spots was selected in a ZIG-ZAG pattern to ensure homogienity.
- **Step 2** – A V – Shaped pit to a depth of 30 cm. Thick slices of soil from the exposed edges of the V-shaped pit (from top to bottom) was collected.

Soil sample to be collected. 30 cm.



Step 3 –The soil samples were thoroughly mixed together forming one bulk of the soil. The bulk was reduced to about one kilogram by Quartering. Quartering was done by dividing the thoroughly mixed sample into four equal parts. The two opposite quarters were discarded and the remaining two quarters were mixed and the process was repeated until the desired sample size was obtained.The sample was collected in a clean polythene bag. In this way one kg sample of both processed and unprocessed soil was given for soil testing.

3. Preparation of seeds for group a (as per *Vrukshayurveda* method)

Dry grass ash was prepared by burning the dry grass collected from the field. After the cooling of the ash, the seeds of patol were rubbed with the ash between both the hands.

Seeds for the respective groups was soaked separately overnight in the water prior to the sowing. **30 viable seeds** was selected for each group.

Figure No. 2: Preperation of seeds for group a (as per vrukshayurveda method)

Procedure for Seed Selection for cultivation: **Seed floating test** was done for selection of healthy seeds. Collected seeds of *Patol* (*Trichosanthes anguina* L*)* was kept in water. The seeds which floated on the water surface was discarded and replaced by same number of seeds. The seeds that remained at the base was taken for sowing. In this way viable seeds was selected and prepared for sowing.

Figure No. 3: Seed floating test

Preparation of seedling tray for three groups.

1. **Group A – Cocopit + processed soil (*tila* cultivated soil) + cowdung.** Processed 30 seeds were sown in group A tray
2. **Group** B - **Cocopit + unprocessed soil + cowdung** were filled in third trey. Unproc- essed 30 seeds were sown in this tray.
3. **Group C –Cocopit + unprocessed soil + cowdung** were filled in third trey. Unprocessed 30 seeds were sown in this tray

Compost : Cow dung manure and sesame oil cake water were used as compost for the respective groups as follows-

Group A – Sesame oil cake water (as per *Vrukshayurveda* method)

20 gm Sesame cakes were soaked in 1 litre water for 8 hours. The water was then filtered and used as a compost material and was sprinkled on the plants every 7 days in the month of *Chaitra*.

Figure No. 4: Preparation of Sesame cake water

Group B and group C – Cow dung.

Cow dung as compost was added to the soil after every 1 month

Irrigation :

Plants in all the groups were irrigated by the

available tap water source.

Harvesting

Harvesting was done when the fruits were green and tender.

Management of Insect Attack:

Note – group A climbers were not infected. Only the leaves of Group B and Group C were infected.

Thus when the leaves of the climbers were found to be infected, they were then treated with the following methods.

As per Vrukshayurveda -

Sechaye Krumibhirjagdham lataam cha khalikajalai:!

Jayetbhed: Ishtikachurneudghulanam cha krumin Dale!!196

(Surpaalvrukshayurved- Latakrumi)

They were irrigated with *khalikajala* (sesame seeds cake mixed in water). The spray of *Bhasma (Gomay)* and *ishtika churna* (powder of brick) was sprinkled on the affected parts of the climber.

Figure No. 5: Gomay bhasma & ishtika choorna

Folklore Pesticide

A folklore persticide was prepared using the Fresh leaves of *Agnimantha (Premna mucronata*), *Sitaphal (Annona squamosa), Arka (Calotropis gigantean), Neem (Azadirachta indica), Beshram (Ipomoea carnea) and gomutra.* The leaves were collected from institutes herbal garden and nearby field. *Gomutra* was collected from available *Goshala*.

Procedure of making pesticide – Fresh leaves of the above mentioned plants were taken in the quantity of 5gm each and soaked in 3 litres of water and 1 litre of gomutra. This mixture was kept steady for 7 days for decomposition. After

7 days, the mixture was then heated and a decoction was prepared by reducing it to 500 ml. It was then filtered by a cloth and diluted with 1 litre of water. The diluted solution was further sprayed on the climbers.

Figure No. 6: Folklore pesticide formation

Thimate an organophosphate was used for group C as an insecticide
Note – The above 2 methods for pest control were applicable for both group A and group B.

Table No. 1: Methodology of the study

Sr. No.	Seeds	Soil	Compost	Watering	Pest Management
A	*Patol* (Trichosanthes anguina.L.) seeds – processed with dry grass ash.	Soil processed with *Til* cultivation (*Vrukshayurved* a method)	Sesame oil cake water compost (7 days interval)	Water (daily)	*Gomay + Ishitka Choorna & Khalika Jal* (sesame cake water) Folklore pesticide
B	*Patol* (Trichosanthes anguina.L) seeds – unprocessed	Soil processed with *Til* cultivation (*Vrukshayurved* a method)	Cowdung compost Monthly	Water (daily)	*Gomay + Ishitka Choorna & Khalika Jal* (sesame cake water) Folklore pesticide
C	*Patol* (Trichosanthes anguina.L) Seeds – unprocessed.	Unprocessed plain soil (conventional method)	Cow dung compost Monthly	Water (daily)	Thimet

Assessment criteria :

a. **Soil testing -** Pre and post sample was collected and given for testing in renowned institute.Copper, iron, zinc, manganese, pH, Alkali, organic carbon, phosphorous, potassium these micro nutrients were tasted in the soil.

b. **Germination Time** – it is the on set of germination.

c. **Germination Rate** – It was calculated according to the equation ISTA (Indian Seed Testing Association)

$$Germination(\%) = \frac{\text{Number of seed germinated}}{\text{Number of seeds on tray}} \times 100$$

d. **Flowering Time -** It is the onset of Flowering.

e. **Fruiting Time -** It is the onset of fruiting

f. **Number of flowers** – It was recorded group wise in tabular form

g. **Number of Fruits -** It was recorded group wise in tabular form

h. **Yield** – Yield obtained from all the three groups was recorded and compared in terms of the number of fruits and average weight of fruit.

Observations And Results:

Soil testing – below table shows significant risein the levels of ferrous sulphate, potassium, Alkali, and Zinc in processed soil. Whereas Copper, phosphorus, organic carbon, Manganese were decreased in processed soil. pH of both the soil samples were alkaline, showing not much difference.

Table No. 2: Soil Analysis of Processed and Unprocessed

Sr. No.	Parameters/Micro Nutrients	Unprocessed soil	processed soil
1.	Copper (cu)	2.44	2.10
2.	Ferrous sulphate (Feso4)	2.20	9.96
3.	Zinc (zn)	1.62	6.56
4.	Manganese(Mn)	2.76	1.86
5.	Ph	8.12	8.14
6.	Alkali	0.18	0.23
7.	Organic carbon	0.81	0.72
8.	Phosphorous	7.84	6.58
9.	Potassium	692.84	725.58

Table No. 3: Germination Rate

Sr. No.	Name of the seed	Trichosanthes anguina		
1.	Treatments	A	B	C
2.	No. seeds planted	30	30	30
3.	No. seeds that germinated	16	14	13
4.	Percentage of seed that germinated	16/30 x 100	14/30 x 100	13/30 x 100
5.	Rate of seed germination	53%	46%	43%

The rate of germination was seen more in group A (33.3 %) than group B (23.3 %) and group C (16.6 %). Thus it was observed that rate of germination of group A seeds were better than that of group B followed by group C.

Table No. 4: Germination time

Group	A group	B group	C group
Days	**9 days**	**11days**	**11 days**

Group A seeds (processed seeds) germinated early (10 days) as compared to the seeds of group B (11 days) and group C (13 days) which were kept unprocessed.

Table No. 5: Flowering time

	DAYS				
GROUPS	62th	63th	64th	65th	66th
A1	α				
A2	α				
A3	α				
A4		α			
A5		α			
B1		α			
B2		α			
B3				α	
B4			α		
B5		α			
C1				A	
C2				α	
C3				α	
C4				α	
C5				α	

On an average, flowering time was as follows -

Table No. 6: Average Flowering time

Group A	GROUP B	Group C
62 days	**63 days**	**65 days**

The above result shows that, GROUP A got the early flowering followed by GROUP B and lastly GROUP C .

Table No. 6: Fruiting Time

GROUPS	70	71	72	73	74	75	76
A1		α					
A2		α					
A3	α						
A4				α			
A5							
B1			α				
B2				α			
B3				α			
B4					α		
B5					α		
C1						α	
C2							
C3					α		
C4							α
C5				α			

On an average, fruiting time was as follows -

Table No. 7: Average Fruiting time

Group A	GROUP B	Group C
71 days	**73 days**	**74 days**

Table No. 8: Number of Flowers

	Days					
Groups	63	70	77	114	total	Percentile
A	11	10	13	11	45	**37.5%**
B	11	13	10	7	41	**33.3%**
C	8	11	5	10	34	**28.3%**

Group A shows more number of flower count than that of the group B and Group C. Flowering rate of group A plants were observed to be more than that of group B and group C

Table No. 9: Number of Fruits

	Days				
Groups	77	114	128	Total	Percentile
A	4	5	4	13	**45 %**
B	2	4	3	9	**31%**
C	3	2	2	7	**24%**

Group A has a better fruiting rate than other groups showing a rate of 45% than group B and Group C.

Table No. 10: Yeild

Group	Fruit count	Total fruit weight	Average weight of a fruit.
A	13	15.5 kg	1.1 kg
B	9	8.47 kg	940 gm
C	7	5.59 kg	790 gm

Yield was found to be more in Group A as compared to Group B and Group C.

Table No. 10: Organoleptic tests

Sr. No.	Tests	Group A	Group B	Group C
1	Shabda	Not specific	Not specific	Not specific
2	Sparsha	Smooth	Smooth	smooth
3	Rupa – colour Shape –	Green with white striations Long cylindrica shape	Faint Green with white striations Long cylindrica shape	Green with white striations Long cylindrica shape
4	Rasa	Madhur	Madhur	Madhur
5	Gandha	Characteristic	Characteristic	Characteristic

Table No. 11: Flowering , Fruiting and Fruits

Discussion –

Soil preparation and soil analysis

The results of the soil testing showed a significant difference in the mineral content between the 2 samples of the soil (pre cultivated/plain soil and post cultivated / processed soil) where til cultivated soil showed more increased values of minerals. Sesame seeds contains minerals like **calcium, iron, magnesium, phosphorous, potassium, sodium and zinc.** This clearly indicates the effect of til cultivation on the soil.

Seed processing and Germination

Seeds of *Trichosanthes anguina.* L sprouted early in case of group A and even more in number than in other groups. This might be due to the effect of the seed processing done on the seeds of group A. Some of the seeds of group B and Group C were found to become **hollow, brittle easily broke and spoiled till sowing** while the seeds of group A were remained healthy till the time of sowing. The dry grass ash i.e the straw naturally contains certain minerals like **Potassium, Calcium, Phosphorous and Magnesium** and microelements like **Iron (Fe), manganese (Mn), Zinc (Zn), Copper (Cu).** Besides ash were used in the ancient days for the preservation of seeds since it absorbs the moisture and prevents the seeds from getting decomposed.

Pest management - Leaves of cucurbits are usually affected from pest leaf minor worms. It shows a white worm-like appearance on the surface of the leaves. The leaves of group Ahardly showed any pest infestation. This can be due to **the prior use of khalika jal** (sesame oil cake water) as compost , but which is also mentioned in the reference of pest management as per vrukshayurveda. According to researches, **sesame showsPesticidal uses like nematicide, insecticide, antimicrobial, fungicide, herbicide, rotendicide.**Leaves of group B and C showed significant pest infestations. The gomay and ishtika choorna sprinkled on the leaves of group B along with watering of khalika jal (sesame oil cake water) showed slight decrease in the pest on group B leaves. Hence later it was treated with the folklore pesticidal spray which showed significant fall in the pest and also

restricted its spread. The five leaves used in the pesticide spray has **krimighna properties and fermented gomutra shows pesticidal properties** according to ICAR (Indian council of agriculture and research). Use of thimet on group C also showed significant decrease in the pest.

Flowering and Fruiting –

Group A showed maximum number of flowering and fruiting thereby giving maximum yield as compared to the other groups. This can be due to the effect of the methods used for this group. **Sesame seeds are a good source of minerals like calcium, iron, magnesium, phosphorous, potassium, and zinc.** These are among the essential minerals of the plant required for a proper growth. Also sesame cake is an **organic fertilizer** useful for the plants. The processed soil of group A (til cultivated soil) was found to be rich in potassium. **Potassium being one of the essential nutrient for the plants promotes flowering and fruiting in a plant.**

Conclusion:

Based on the observations, Group A (*Vrukshayurveda* method for *Patol* cultivation and soil processing) showed maximum results than group B (*Vrukshayurveda* method on only soil processing) and group C (conventional method). This result can be due to the combined effect of soil processing, seed processing and use of *Khalika Jal* (sesame cake water) as compost for group A . Group B where only soil was processed as per *Vrukshayurveda* method also showed better result than the conventional method. Thus it can be concluded that the method given in *Vrukshayurveda* is beneficial for the cultivation of *Patol*. It indicates that *Vrukshayurveda* can be proved efficient for the cultivation of medicinal plants and maintaining the natural qualities of the plants.

Source of Support: Nil

Conflict of Interest: Nil

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