

## **PROFORMA FOR ANNUAL PROGRESS REPORT (IERP PROJECTS)**

**1. Project Title:** Exploring nettle as an alternative nutrition rich field crop in Uttarakhand

**2. Name of Principal Investigator:** Dr Vasudha Pant

**Name of Project Staff:** Ankur Tripathi

**3. GBPIHED project sanction letter no. & Date of sanction:** GBPI/IERP – NMHS/ 15-16/04/24

**4. Total outlay sanctioned-** Rs 7, 17,150/- only (Rs seven lakh seventeen thousand one hundred and fifty only)

**4.1 Duration-** three years

**5. Date of start –** 2 May 2016

**6. Grant received during the year-** Rs 2,26,000/- only (Rs Two lakhs twenty six thousands only)

**7. Expenditure incurred during the year –** Rs 2, 26,071/- only

**8. Bound area of research-** NMHS support to IERP

**9. Sub area of the project-** Sustainable management of land and water resources

**10. Approved objectives of the project:** ultimate objective is to establish nettle as a field crop. To achieve this goal project has been framed with following objectives-

1. To test the performance of nettle as field crop
2. Thorough testing of nutritional components in nettle
3. To find out variation for nutritional and yield traits

#### 4. Testing its efficacy in white grub (kurmula) control

11. **Methodology** – for second year methodology as given in project proposal was as follows-

- Collection of planting material
- Planting collected material in different seasons in new plot of the same locations
- Record similar observations as in the previous year in the plots of the previous year to compare the data of two years.
- First picking of the edible green portion of stem after sowing
- Days of re-sprouting of branches after picking
- Number of branches appearing after every picking
- Edible herb yield per plant from sowing to flowering
- Days of harvesting seeds from sowing
- Seed yield per plant (by weight)
- After seed harvesting cutting the plant and leaving for regeneration in the following season
- Root yield per plant from both 1 year and 2 year old plants
- Testing nettle water impact on white grub

12. **Work Plan** - The study material is the perennially available stinging nettle. Planting material (seed/rhizomes) will be collected from local area based on density of trichomes on the plant. Thus two types of genotypes will make the seed material. Experiment will be conducted over two years. Field testing will be done at one location in replicated plots by raising collected material in two seasons per year. One experimental plot will be of one nali.

Analysis of variance (ANOVA) will be used to test variation for yield attributing and nutritional characters within and among genotypes

- over seasons
- over two years

ANOVA will be used to test variation in root yield/plant between one year and two year old plants.

**Measurements proposed**–

- Determining the appropriate planting material, time of sowing/planting in accordance with local conditions

- Determining the appropriate harvesting stages for leaves, roots and seeds
- Assessment of the seasonal variation for herb yield and nutritional quality
- Determining the factors influencing yield and quality
- Standardization of drying process in order to obtain quality product
- Post harvest handling of material
- Testing its efficacy in white grub control.

**13. Salient research achievements as per work plan/objectives covered during the year-**

- Survey and collection of planting material (seed/rhizomes) and leaf samples of nettle from area between Almora and Pithauragarh
- Planting of the collected material in new plot
- Recording of field data: First picking of the edible green portion of stem after sowing, days of re-sprouting of branches after picking, number of branches appearing after every picking, edible herb yield per plant from sowing to flowering, days of harvesting seeds from sowing, seed yield per plant (by weight)
- Testing of nutritional components in dried leaves from the experimental plot and wild collection
- Laboratory testing to know variation over replications and seasonal variation for nutritional content
- Preparation of nettle water and testing its effect on white grub in the planted pots.
- Similarly laboratory testing was also done to standardize the drying process.

However elaborate testing of nutritional components in dried leaves at varied stages of harvesting could not be done due to insufficiency of fund. Still we have some encouraging results (tables 1-7d).

- a. Visits and survey:** visits of different places of Kumaun region of Uttarakhand to survey the area to have an idea of distribution of nettle and collect information on use of nettle.

In general soft shoot tips and leaves of *Urtica dioica* and *Urtica parviflora* are used as green leafy vegetable in villages of kumaun and Garhwal. However its use as vegetable is not prevalent in Pithauragarh. Also its not found in abundance. For feeding animal it has been in huge demand says Mrs Jyoti Pant who belongs to Pithauragarh.

According to Mr Dayanand Joshi of Gallakot village of Hawalbagh block in Almora district if once in a month 'shishoona' is applied topically on body it keeps you away from many diseases (immunity enhancer).

- b. Collection of material-** for testing leaf material was collected from different places between Almora and Pithauragarh on the basis of height of the place from sea level.



Figure 1: Sample collection

These are:

S.No	Location	Sample name	Height of place from sea level
1	Nakuleshwar road	N	About 1500 m
2	Near Gurna	Gr	Not known but it should be around 1300 m
3	Kandanaula	K	1316 m
4	Dhauladevi	D	1860 m
5	Garurabanj	Gb	1950 m

- c. Nettle Water application on pots-**

For making nettle water, healthy nettle plant was selected in the vicinity. The plant was chopped approximately 6-10 inches above the ground. After collecting in a plastic drum this plant was further chopped/ crushed with stick or shovel. Crushing of the material is done to speed up the process of fermentation. This material should cover approximately 2/3<sup>rd</sup> of the drum. After crushing the leafy material the drum is filled with water to a level till whole of the material is immersed in water. The water should not be filled till top as water level rises while fermentation process of material and spillage of the water occurs. This drum needs to be covered with tight lid and kept in the area to receive direct sunrays. Preferably this drum should be kept away from the home and lid should be tight to avoid the bad urine like stink arising while fermentation. Drum can be opened in between to check the fermentation process. Generally if weather is warm 2 weeks time is enough for fermentation to complete.

This was left for fermentation for approximately 3 weeks. After this the drum was opened and when all green parts were disappeared and only hard cellulose part was remaining, it meant that fermentation is complete. This hard part was separated and thrown in garbage heap. Nettle water is ready for use in the field. This water was stored in air tight containers/ bottles for further use. This water needs to be diluted before applying to the plants. Generally it is applied in a ratio of 1:10, meaning 1 part of nettle water and 10 parts of water.

During the year one of the project nettle water was prepared and on the basis of 10 day's interval it was applied in around 40 pots from December 2016- March 2017. Of these 20 pots were emptied in the end of month of May before planting new saplings of flowers to check the presence of white grubs. Almost 15 pots were free of white grubs and five pots had 2-6 grubs. 5 pots in which nettle water was



Figure 2: insect infestation on chrysanthemum

not applied were also checked for grub's presence. They were full of white grubs and their number in these pots ranged from 8-15. On other pots where nettle water was applied but not checked for grubs had no plant damage.

During second year again nettle water was prepared like year one and applied on 30 pots and checked for white grubs in the last week of April. Results were quite discouraging as only five pots were devoid of grubs and others had high presence 5-12 numbers of white grub.



Figure 3: Insect damaged chrysanthemum

Other than white grub it was also applied for other insect damage (figure 2 and 3 ).

The insect was sucking leaves and damaging chrysanthemum plants very fast. I applied nettle water by foliar application to all the plants present in the strip. For two days I observed the reaction but could not recognize any major impact. However it was realized that the spread of insects had been slowed down. I removed the already damaged plants and rest of the plants were rescued.

**14. Summary of progress** – As the title of the project ‘Exploring nettle as an alternative nutrition rich field crop in Uttarakhand’ suggests the purpose of the project is to bring nettle into limelight as nutrition rich field crop and attract planned research to use it for welfare of the state and humanity. To achieve objectives of the project the planting material was collected in previous year from four different locations and planted in the field in the vicinity of the organizations office. Observations on the herb/ seed yield attributing characters have been collected in second year on the lines planted in previous year. Leaves from all lines and both of the replications were collected and tested for nutritional component viz: protein, Ca, Fe, Mg for knowing variation between replications in a single season, to know seasonal variation for these nutritional parameters, to know variation for drying method. The laboratory testing for Ca, Mg, Fe and protein was done at National Collateral Management Pvt. Ltd. (NCML). All the laboratory

analysis have shown that nettle leaves are rich source of protein, Ca, Fe and Mg. Between replications in single season calcium content ranged from 39501.83 mg/kg to 57312.31 mg/kg, magnesium from 4538.03 mg/kg to 9011.88 mg/kg and iron from 334.69 mg/kg to 673.63 mg/kg in dried leaves of tested nettle samples (table 1). Similarly seasonal variations also occurred among lines (table2) However variation for these parameters was nonsignificant at 5% level of significance as tested by paired t-test (table 3a-3d) for seasonal variation and between replications (table 4a-4d). That is indicative of suitability of all the harvesting times tested for nutritional values. Protein content in dried leaves ranged from 28.75% - 30.97%.

Some more leaf samples were collected from different locations between Almora and Pithauragarh and were analyzed for calcium, magnesium, iron and protein at NCML Gurgaon. Calcium content ranged from 44498.88 mg/kg to 52276.32 mg /kg, magnesium content ranged from 7552.78mg /kg to 10516.32 mg/kg, iron from 261.03 mg/kg to 441.06 mg/kg and protein content varied from 28.85% to 30.19 % (table 5). Percent differences for all the components from all the locations were calculated from a randomly tested sample from Garurabanjh and that indicated variation (table 6a- 6d). However to know the significance variation application of ANOVA will be required that may be done in future studies.

The leaf samples from single plant and same time and method of plucking were tested for variation for nutrition component with sun drying, shade drying and microwave drying methods (table 7). And percent variation from sun drying method was calculated (Table 7a-7d). Percentage analysis shows variation in Ca, Mg, Fe and protein content with drying method and in general sun drying seems to be best option. However to know the significance of variation or to apply ANOVA the testing was required at least in 2 replications that may be done in future studies.

Along with experimentation the work has been presented in 2 seminars: one in ‘ 49<sup>th</sup> national conference of nutrition society of India’, and other in ‘12<sup>th</sup> Uttarakhand state science and technology congress’(abstracts attached). An article has also been submitted to the Kalp Foundation Himanchal Pradesh for a research journal related to Himalayan studies (paper attached). Visits were made to National institute of nutrition Hyderabad, GB Pant University, Pantnagar; and Patanjali Research Institute, Haridwar; to to discuss the significance of plant and

future research prospects. Visits to hill regions of Kumaun region of Uttarakhand to survey the area and collect information on uses of nettle.

15. **New observations** – Nettle rhizomes were planted in the month of July on 20<sup>th</sup> on rocky surface that had very shallow soil cover. Although establishment rate was only 20% some of the plants could survive and new shoots started appearing in 20 days.



Figure 4: nettle seeds

Flowering is very nonsynchronized. In older shoots flowering started by 15<sup>th</sup> July and in newer shoots flowering was delayed till September to mid October. Synchronized flowering is essential for harvesting of seeds that could be harvested in December. Seeds are also great source of nutrition. Other than this as reported in research articles it has positive impact on kidney. Nettle seeds are very small in size. Unless synchronized fruiting is achieved harvesting of seeds is very difficult. If we want to use seeds for commercial benefits synchronized flowering and fruiting has to be attained

16. **Innovations**- with limited set of data much can not be said about its use as field crop however it can be emphasised that it is nutritionally rich plant.

17. **Research work which remains to be done under the project referring to Objectives to be covered**- Till now two year observations have been taken on field. More observations will be taken on seed harvesting that will be helpful to device a protocol for seed harvesting. Laboratory testing of some more parameters will be helpful in inferring its use as food component or developing nutraceuticals.

Efficacy of Nettle water will be tested once again on white grubs and this application schedule will be different.

In the same chrysanthemum bed infestation of insect will be observed.

Plant will be uprooted in June 2018 to find out single plant root yield in both the replications.

Final technical report will be prepared based on the observations and data available.

Signature of PI

Dated-