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PROCESSING OF MEDICINAL PLANTS CULTIVATED
AND COLLECTED IN NEPAL

DP/NEP/80/044

NEPAL

Technical report: Odour assessment of essential oils
and aromatic plant products*

Prepared for the Government of Nepal
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Mr. Govind D. Kelkar
Consultant perfumer/organolectic analyst

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Introduction

1. His Majesty's Government of Nepal set up a Company called Herbs Production and Processing Company Limited in the year 1982. The project became operational only from 10th October 1984 with the help of Production Technologist/Chief Technical Adviser Dr. B.C. Gulati from UNIDO.

During the last 3 years the company has developed production of a number of products derived from medicinal and aromatic plants available in Nepal and is now economically viable unit.

2. Considering the importance of maintaining high standards of quality as well as uniformity of production, UNIDO appointed Mr. Govind D. Kelkar, Managing Director, S.H. Kelkar and Co. Ltd., Bombay as Consultant Perfumer/Organoleptic Analyst for a duration of 15 days.

3. The duties allotted to the Consultant by UNIDO are shown in Annexure I.

4. The Consultant started work on 5th November 1987 and the present report is based on his findings.

a. To examine the possibility of setting up organoleptic analytical unit at HPPCL.

During last 3 years considerable progress has been made by HPPCL and the production has reached almost NRs. 82,00,000.

With this size of production and taking into consideration future requirements it is necessary to set up a testing laboratory in HPPCL.

The laboratory could be divided in 3 parts.

- i. Analytical laboratory - This will be useful to collect physicochemical data of raw materials as well as products. Most of the equipment is available but the work is combined with Developmental aspects also.
- ii. Chromatography laboratory - For essential oils it is essential to have this laboratory because it will help HPPCL to keep a control on raw materials as well as finished products.

- iii. Organoleptic laboratory - For odour evaluation it is essential to have a separate well ventilated room. For storage of standard samples a refrigerator can be used or a separate air conditioned room can be provided attached to this laboratory.

The laboratory unit should be preferably isolated from production, so that clean atmosphere is available while evaluating the products.

b) To assist in collection of reference samples for comparative organoleptic evaluation.

- i. The Consultant brought with him Standard Samples of important essential oils. Samples of major constituents of essential oils have also been given to HPPCL for making a library of standard samples. List of samples supplied is given in Annexure II.
- ii. HPPCL had procured samples for 1) Resinoid Oakmoss 2) Resinoid Treemoss and 3) Juniper berry oil from abroad. But on comparison with products made by HPPCL they were not found to be authentic.

c) Training technical personnel "On site" in sensory evaluation

- i. Based on discussions with General Manager Dr. A. Sheak and Technical Adviser, Dr. B.C. Gulati a plan was drawn to impart training to the technical personnel connected with the work of HPPCL, Kathmandu. A copy of this programme is attached to this report as Annexure III.
- ii. The personnel who participated in the training programme is given as Annexure IV.
- iii. Instructions along with practical demonstration were given to the participants twice a day (morning and afternoon) and were asked to study specific products).

After one week they were able to describe the odour as well as evaluate the products with standard samples.

iv. Preliminary training has been imparted to the participants. They have now to carry out regular practice to acquire the requisite skill.

v. As a producer it is not enough to compare the quality of a lot sample with standard sample. If there is any variation the reason has to be found out.

Various factors affecting odour of final product were discussed in details along with comparison of substandard samples. The factors affecting odour are given in Annexure IV.

vi. For correct evaluation it is necessary to have some idea about the art of blending.

Lectures with demonstration were arranged for this purpose.

vii. For olfactory evaluation sometimes it is necessary to dilute product in alcohol. Pure quality alcohol was not available. A laboratory method has, therefore, been suggested to purify alcohol.

d) Evaluate market potential for new essential oils absolutes and concretes and suggest ways of improving quality.

Among the products made by HPPCL the following have been found satisfactory.

01. Sugandh kokila oil
02. Timur oil
03. Calamus oil
04. Citronella oil (new variety)
05. Juniper berry oil
06. Tagetes oil
07. Resinoid tree moss
08. Absolute tree moss
09. Turpentine oil
10. Palmarosa oil

11. Gaultheria oil
12. Resinoid valerian
13. Absolute valerian
14. Oil of Jatamansi
15. Resinoid Jatamansi

The following products can be made but improvement in their production have been suggested.

1. Ambrette seed oil

- From the available raw materials the following products could also be developed on large scale.

- Orris concrete
- Thyme oil
- Labdanum gum
- Mentha arvensis oil
- Jatamansi oil

- Some of the new products made have to be evaluated from perfumery point of view.

- Rhododendron oil
- Basil oil
- Lemongrass oil
- Osmanthus concrete

e) Use of fixed oil from Sugandha Kokila

It is estimated that about 100m tonnes of Sugandha Kokila berries would be processed per year. The estimated available fatty oil would be about 25 m tonnes. This oil could be used in soap making etc. It would be uneconomical to extract fatty oil on small scale. Berries after distillation could be sold to a solvent extraction plant.

Recommendations

1. As stated in the report a separate Quality Control Laboratory should be set up preferably at a distance from the production unit so that fresh atmosphere is available.
2. Technicians doing olfactory assessment should be in touch with latest developments and should be sent abroad for training.
3. To get products of standard quality care should be taken about points mentioned in Annexure IV.
4. Proper upkeep of standard samples at low temperature is essential. Lot samples of various products should also be preserved which are helpful in future work.
5. Large scale production and sales promotion of following items should be immediately undertaken:-

01. Sugandha kokila oil
02. Timur oil
03. Calamus oil
04. Citronella oil (new variety)
05. Juniper berry oil
06. Tagetes oil
07. Resinoid tree moss
08. Absolute tree moss
09. Turpentine oil
10. Palmarosa oil
11. Gaultheria oil
12. Resinoid valerian
13. Absolute valerian
14. Oil of Jatamansi
15. Resinoid Jatamansi

Acknowledgement

As consultant I have great pleasure to place on record my sincere gratitude to the IMG Nepal and UNIDO/UNDP for giving me this opportunity. I am thankful to Dr. A. Sheak, General Manager, HPPCL and National Project Director and Dr. Baldev Gulati, Chief Technical Adviser of the project for their deep interest in my work for the project. I am also thankful to the technical staff for the interest they have shown in the project.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT IN THE GOVERNMENT OF NEPAL

JOB DESCRIPTION

DP/NEP/80/044/11-3

Post title Consultant Perfumer/Organoleptic Analyst

Duration 0.5m/m

Date required ASAP

Duty station Kathmandu (Nepal)

Purpose of project To enable his Majesty's Government (through the Herbs Production and Processing Co. Ltd.) to acquire processing technology for the production of plant derived pharmaceuticals.

Duties

- a) To examine/possibility setting up organoleptic analytical unit at HPPCL.
- b) To assist in collection reference samples for comparative organoleptic evaluation
- c) Training technical personnel 'on site' in sensory evaluation
- d) evaluate market potential new essential oils, absolute and concretes and suggest ways of improving quality.
- e) suggest possible use fixed oil from 'sugandh kokila' (cinnamomum polyandra) and similar exotic seed oils.

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Applications and communications regarding this Job Description should be sent to:
Project Personnel Recruitment Section, Industrial Operations Division
UNIDO VIENNA INTERNATIONAL CENTRE P.O. Box 300 Vienna, Austria

Standard Samples brought by Consultant for Reference Library

1) ANETHOLE	47) LAVENDER OIL
2) ATLAS CEDERWOOD OIL	48) LINACOL
3) ANISE SEED OIL	49) MANDARIN OIL
4) BERGAMOT OIL	50) METHYL ANTHRANILATE
5) BENZYL ACETATE	51) MENTHOL CRYSTAL
6) BORNEOL	52) MENTHONE
7) BASE OIL	53) NUTMEG OIL
8) CLOVE LEAF OIL	54) OLBANUM OIL
9) CARYOPHELENE	55) ORANGE OIL
10) CLARY SAGE OIL	56) PHENYL ETHYL ALCOHOL
11) CITRONELLAL	57) PALMA ROSA OIL
12) CITRAL	58) PETIGRAIN OIL
13) CITROJELLA OIL	59) PARACRASYL METHYL -- ETHER
14) CARVENE	60) PEPPER OIL
15) CINNAMIC ALDEHYDE	61) PATCHOULI OIL
16) CINNIC ALDEHYDE	62) PEPPERMINT OIL
17) CARDAMUM OIL	63) ROSEMARY OIL
18) CORIANDR OIL [MENTHA ARVANSIS OIL]	64) ROSE OIL
19) CINNAMON LEAF OIL	65) SAFROL
20) CELERY SEED OIL	66) SANTALWOOD OIL
21) CARENE	67) SANTALOL
22) CANANGA OIL	68) SPIKE LAVENDER OIL
23) CIS JASMONE	69) SWEET FENNEL OIL
24) CITRONELLOL	70) SPEARMINT OIL
25) CALAMUS OIL	71) TERPINEOL
26) DAVANA OIL	72) VETIVER OIL
27) EUGENOL	73) YLANG YLANG OIL
28) EUCALYPTOL	
29) ESTRAGOLE	
30) EUCALYPTUS OIL [CINEOLE-TYPE-EUCALYPTUS OIL]	
31) GERANIUM OIL	74) PINENE
32) GALABANUM OIL	
33) GUAIACWOOD OIL	
34) GINGER OIL	
35) GERANIOL or PALMA ROSA	
36) GERANIOL PURE	
37) HIMALAYAN CEDERWOOD OIL	
38) INDOL PURE	
39) JASMIN ABSOLUTE	
40) LINALYL ACETATE	
41) LEMON OIL	
42) LIME OIL [COLD PRESSED]	
43) LAVENDIN OIL	
44) LEMONGRASS OIL	
45) LIME OIL [DISTILLED]	
46) LONGIFOLENE	

Work Programme of Mr. U.D. Kelkar, Short Term Consultant
during 6th November to 20th November 1987

- 6th November 1987 - Introduction
- 1) General information on essential oils, resinoids, concretes, absolutes and spice oleoresins.
 - 2) Analytical methods.
 - a) Physico-chemical data
 - b) Instrumentation techniques
 - c) Olfactory assessment.
- 9th November 1987 - 1) Practical demonstration on techniques of Olfactory assessment.
Odour evaluation at different stages of evaporation.
- 10th November 1987 - 1) Practical demonstration on comparison of samples from different lots with standard product.
Comparison using three smelling strips.
- 11th November 1987 - 1) Study of reasons for failure of sample in Olfactory tests.
- 12th November 1987 - 1) Instrumental methods of analysis.
- 13th November 1987 - 1) Special techniques to be used in Gas Chromatography with reference to perfumery materials.
- 15th and
16th November 1987 - 1) Use of different raw materials for creating fragrance.
2) Art of blending a brief introduction.
3) Assembly with RDRL staff.
- 17th November 1987 - Group discussion on the subjects discussed earlier.
- 18th and
19th November 1987 - Market prospects of natural perfumery materials.
World market statistics.
Evaluation of products produced by HPPCL.
Development possibilities for new products in Nepal.

Summary of Factors Affecting Odour and Quality of Essential Oil

Raw Material

1. Contamination during collection or processing.
2. Variety of plant material.
3. Pretreatment not proper (Drying etc.).
4. Harvesting at early stage or overgrowth.
5. Use of pesticides etc.
6. Exposure to radiation.

Processing

1. Quality of steam.
2. Time of distillation.
3. Heating on direct fire.
4. Material of construction of distillation unit.
 - a) Coloration.
 - b) Chemical reaction.
5. Cleaning of equipment.
6. Cohobation (ex Rose)

Storage

1. Contamination of storage vessels.
2. Material of construction of storage vessels.
3. Moisture in the product.
4. Effect of light.
5. Effect of air.
6. Plastic containers.

List of Participants

I. Herbs Production and Processing Company Limited

1. Dr. Asfaq Shek
2. Mr. Uddhav Raj Poudyal
3. Mr. Jai Pradhan
4. Mrs. Himu Chapagain
5. Mrs. Minoba Yonzon
6. Mr. Ashsan Khan
7. Mr. Paras Man Tuladhar

II. Royal Drugs Research Laboratory

8. Dr. S.R. Adhikari
9. Mr. Navin Shrestha
10. Ms. S.P. Upadhyaya
11. Ms. Ramila Pradhan
12. Ms. Roshani Shakya
13. K. OKUDA (Volenteer from Japan).