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PRODUCTION OF PHARMACEUTICAL MATERIALS FROM  
MEDICINAL AND AROMATIC PLANTS, PHASE II

DP/TUR/88/001

REPUBLIC OF TURKEY

Technical report: Findings, work performed and recommendations\*

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

Based on the work of Mr. Sudhir Jain, expert in  
compounding and blending of perfumes

Backstopping officer: R. O. B. Wijsekera  
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Vienna

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\* This document has not been edited.

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## INTRODUCTION

Anadolu University Medicinal Plants Research Centre was set up in 1982. The project DP/TUR/83/003, "Production of pharmaceutical materials from medicinal and aromatic plants" funded as part of an agreement between the Turkish Government and UNDP/UNIDO has enabled the Centre to greatly extend its activities.

Following successful completion of the aforementioned project, the 2nd phase project DP/TUR/88/001 has started in 1988.

### Background information

The Government of Turkey considers the valorisation of plant-based indigenous natural resources to merit high priority. In order to develop the technological means to enable them to do this in Turkey, the Government sought the assistance of UNDP and UNIDO in 1983. Accordingly, a technical assistance project executed by UNIDO was sited at the Anadolu University Medicinal Plant Research Centre. The Centre's capability was strengthened in regard to research and technology development in respect to plant-derived pharmaceuticals as well as in the processing and fractionation of essential oils. It is hoped to develop the Centre's capability still further to enable it to advise industry in regard to product development and an extended project was initiated in 1988. The present requirement is in fulfillment of this extended project objective.

### Purpose of project

To strengthen the present capability of the Medicinal Plants Research Centre of Anadolu University, Eskişehir to enable it to undertake in addition to its present commitments, work on Essential Oils and the formulation of Flavours and Fragrances.

Post title

Perfumer

DP/TUR/88/001/11-52

Duties

The expert was expected to study the present situation and capability of the Medicinal Plants Research Centre with a view to setting up a fragrance formulation and sensory evaluation laboratory.

The expert was expected to conduct a short course in fragrance formulation and make suitable recommendations within a comprehensive report.

The mission of the expert covered the aforementioned activities and few other aspects of the project which were added to the expert's duties on the request of the national project director Prof. Dr. K. H. C. Başer.

## SUMMARY

The mission took place between January 2nd and 29th 1991 during which time the expert was attached to TBAM (Tıbbi Bitkiler Araştırma Merkezi) situated at Anadolu University, Eskişehir.

As per the terms of references of the assignment the expert functioned as a member of a team, headed by Prof.Dr.K.H.C.Başer National Project Director.

The expert was located at TBAM (Tıbbi Bitkiler Araştırma Merkezi) of Anadolu University, dedicated to the development of national resources of botanic origin.

Under the guidance of the National Project Director for the project, the expert carried out the following specific functions:

1. Assisted in developing local expertise in compounding fragrances and sensory evaluations by conducting an in depth course at TBAM.
2. Assisted in setting up a sensory evaluation laboratory.
3. The organoleptic evaluation of raw materials and products especially indigenous Turkish Essential Oils such as Rose oil, Ziziphora oil, etc. was carried out in detail.
4. Assessed the potential for creating an aroma chemicals and fragrance materials manufacturing facility in Turkey.
5. Formulated recommendations in regard to future needs with emphasis on strengthening TBAM's facilities to give better service to the flavour and fragrance industries of Turkey.

Additionally the following activities were performed:

1. A training course for representatives of Turkish Industries was conducted with emphasis on the commercial aspects of the industry and fragrance formulation and sensory evaluation.
2. Specific fragrance formulations for use by TBAM were created.

Adequate facilities were available at TBAM and with the help of the requisite samples of perfumery raw materials and finished fragrances arranged from India, 61 major perfumery raw materials and 21 fragrance formulations were explained in detail. Demonstrations were made by means of practical examples to pharmacists, chemists and chemical engineers of TBAM and the Faculty of Pharmacy in the sensory evaluation and fragrance formulation course conducted by the expert.

11 chemist, pharmacists, chemical engineers were put through the course on the development of local expertise in sensory and odour evaluation and compounding of fragrances and were comprehensively introduced to the techniques involved.

The course on the development of local expertise in sensory and odour evaluation and compounding of fragrances was conducted for a period of seven days and 50 hours of intensive tutorials with practical demonstrations, and due to the active participation by the

Turkish chemical engineers, chemists and pharmacists, the participants were taken to the stage where they could do olfactory assessment independently and also begin to compound primary fragrances themselves.

Modern trade and technical terminology used in the perfumery raw materials field was explained to the participants of the course.

7 representatives of the Turkish Perfumery, Cosmetics and Toiletries Industries were put through a training course with emphasis on the commercial aspects of the industry, fragrance formulation and sensory evaluation.

Assessment was made of the potential for setting up an aroma chemicals production facility to service the Turkish Industry.

An action plan to manufacture synthetic aroma chemicals and the equipment required for setting up the said synthesis plant was determined.

Special fragrance formulations were finalized for use by TBAM.

An action plan was formulated for the integrated development of the essential oils, aroma chemicals and fragrance industries in Turkey by strengthening TBAM' facilities to give better service to the fragrance and flavours industries of Turkey.

Methodology and equipment required for setting up a sensory evaluation laboratory were finalized.

Work Plan of the Expert is attached Herewith as Annexure 1.

## **FINDINGS OBSERVATIONS AND WORK PERFORMED**

1. It is the opinion of the expert that the project should be reoriented or a new project initiated which will consider as the final result, both export of essential oils and their derivatives and manufacture of aroma chemicals and fragrance compounds based on locally available and produced raw materials. There are adequate facilities and qualified staff at TBAM and in cooperation with the State Planning Organization, such a programme should be developed and introduced. Proper training of perfumers will be necessary along with two or three chemists in fragrance chemistry. Necessarily, a sensory evaluation and fragrance development laboratory will have to be created.

Equipment required for the fragrance development laboratory and for the production of aroma chemicals and fragrance compounds can be imported if necessary.

Several actions already taken by the National Project Director are leading in the aforementioned direction.

- i) Chemists, pharmacists and chemical engineers from TBAM and the Faculty of Pharmacy Anadolu University have been trained in the correct method of olfactory evaluation and olfactory assesment.
- ii) The same people have been taken through a detailed course on fragrance blending and compounding techniques and introduced in depth to the intricacies of the Fragrances Industry.
- iii) Along with the aforementioned programme, they have also been made familiar with quality control techniques, in terms of organoleptic evaluation.

- iv) Pilot scale fractionation and reaction units have already been installed and commissioned in TBAM. The personnel required to operate the said units have been trained.

However since technology to produce synthetic aroma chemicals is not yet available, the full utilization of the pilot plant facility will be made only when the technology for the production of aroma chemicals has been made available or developed. The aroma chemicals so produced are to be utilized in fragrances blending units to produce fragrances on an import substitution basis.

2. Conduct of a comprehensive course for the development of local expertise in odour evaluation and compounding of perfumes. (Annexure 2)

With the help of and on the basis of fragrance raw materials samples and fragrance samples arranged by the expert all the way from India entirely at his own expense, the course was initiated.

The sensory evaluation and Fragrance Blending Course covered the following aspects:

- i) Correct Method of Organoleptic Evaluation of Raw Materials and Fragrance Materials
- ii) Definitions of Fragrances and Flavours(Industrial)
- iii) Uses (Industrial) of Fragrances
- iv) Classification of Fragrance Raw Materials and Terminology used in the Fragrance raw materials trade.
- v) Odour descriptions of commonly used fragrance raw materials were discussed and each raw material discussed was physically shown to each participant.
- vi) Workable and useable formulations utilizing only the raw materials presented in the training course were exhaustively discussed, analysed and finalized, each representative of a well known class of fragrances.

3. Training course on odour evaluation and blending of perfumes

- 3.1. Correct method of organoleptic evaluation of raw materials and fragrances

The participants in the training course were shown by practical example, the correct technique involved in odour evaluation, taking within its ambit, the terminology used, avoidance of olfactory fatigue, avoidance of bias, necessity to maintain freedom from contaminating odours, need to maintain a library of standard samples, preservation of smelling strips, importance of a clean environment, the separate procedures involved for liquid, semi-solid and solid samples and the general method for conducting the evaluation.

For details, see Annexure 3.



Instead of lecturing, the expert adopted an attitude of talking to the participants and engaging them in a meaningful discussion, thus drawing them out and breaking down their inhibitions and ridding them of any phobia that they might have had about this subject.

By directly encouraging each participant to freely comment and take part in the discussion, it was ensured that each person had actually understood the topic being discussed. Further by adopting this method the self confidence of the participant was built up and interest in the subject awakened.

Since this approach was followed right through the training course for all the topics, this description of the experts approach and method will not be repeated again and again.

### 3.2. Definitions of fragrances and flavours

Since the training course was only concerned with fragrances destined for industrial use, the definition there of was given in detail by the expert.

### 3.3. Uses (Industrial) of fragrances

The extent and scope of the industrial fragrances industry was explained to the participants by the expert and they were made to realise the very great extent to which modern mankind has become dependent on items of daily use in which industrial fragrances play a critical part.

### 3.4 . Classification of fragrance raw materials and the terminology used in the fragrance raw materials trade

The categories into which the 3000 fragrance raw materials currently in use in the industry, can be classified on the basis of being either natural or synthetic or their source or their method of production were explained in detail, with practical examples by the expert.

For details, see Annexure 4.

### 3.5. Odour descriptions of commonly used fragrance raw materials

Sixty individual commonly used raw materials were physically shown to each participant and the odour descriptions and olfactory characteristics of each one of them were explained in detail and discussed at length with each participant.

### 3.6. Fragrance formulations

Twenty one formulations based on the sixty raw materials presented were given to the participants in the training course and discussed with them. The twenty one formulations represented all the major classes of modern fragrances and thus covered the entire

spectrum of the perfumery field.

The participants were encouraged to understand, discuss, analyse and discover themselves the intricacies of the complex trade.

The techniques used by the Consultant enable to participants to imbibe within the duration of the training course, sufficient expertise to independently formulate elementary fragrances and clearly distinguish between different fragrance raw materials.

#### 4. Setting up of a sensory evaluation and fragrance development laboratory

Detailed methodology for setting up a sensory evaluation laboratory was discussed and finalized including the procedures and precautions involved as well as the equipment required.

For details, see Annexure 3.

#### 5. Organoleptic evaluation of rose oils and *Ziziphora* oils

The analytical work done by TBAM was correlated with the odour pattern of 30 samples of Turkish Rose Oils and 5 samples of the *Ziziphora* Oils. Critical parameters determining the olfactory quality of rose oils and *Ziziphora* oils were identified.

For details, see Annexure 10.

6. Assessment of the potential for utilizing locally produceable raw materials for the production of fragrances.

- i) The potential for optimum utilisation of the existing varieties of essential oils currently produced in the country was examined.
- ii) The potential for diversifying the range of the essential oils produced in the country was examined.
- iii) Workable and useable fragrance formulations based on locally produceable raw materials were finalised.
- iv) An action plan was finalized for the integrated development of the essential oils, aromatic chemicals and fragrance industries by strengthening TBAM's facilities to give better service to the Turkish Fragrances and Flavour Industries.

7. Assessed the potential for creating aroma chemicals and fragrances manufacturing facility in Turkey.

The raw materials available were considered and on the basis of that and the need to eventually create domestic aroma chemicals production facility, the list of aroma chemicals require to be manufactured was finalized as also the equipment required for the same.

For details, see Annexure 5.

8. Recommendations were formulated for the future needs of Turkey vis-a-vis the fragrance industries.

An action plan was formulated for the integrated development of the essential oils, aroma chemicals and fragrance industries with special emphasis on strengthening TBAM's facilities to provide better service to the Turkish Industry.

For details, see Annexure 11.

9. Short course in perfumery for representatives of Turkish Industry

Such a course attended by seven participants was conducted and the following topics were covered.

- i) Fragrance blending and compounding
- ii) Sensory evaluation of fragrances
- iii) Raw materials in fragrance industry
- iv) Application of fragrances in cosmetics and toilet preparations
- v) Nature of international fragrance industry
  - Commercial aspects
  - Trading practices
  - Marketing techniques
- vi) Quality control
- vii) Importance of research and development

For details, see annexure 12 and 13.

10. Special formulations for TBAM

Exclusive fragrance formulations for use by TBAM were created. These formulations include a linden blossom composition to supplement the flavour of instant tilleul tea proposed to be produced in Turkey by the local industry.

## CONCLUSIONS and RECOMMENDATIONS

### A. Conclusions

1. The correct method of organoleptic evaluation of raw materials and fragrance chemicals as taught and explained to the participants taking part in the training course will now enable the following people to undertake odour evaluation and olfactory quality control independently.

1. Dr.Pharm.Yasemin YAZAN
2. Dr. Pharm.Hadi BİLAÇ
3. Dr.Pharm.Neş'e KIRIMER
4. Chem.Eng. Sedat Hakkı BEİS
5. Pharmacist Hülya TANRIVERDİ
6. Chem.Eng. Berrin BOZAN
7. Pharmacist Nilgün ÖZTÜRK
8. Pharmacist Müberra KOŞAR
9. Chem.Eng. Mine KÜRKÇÜOĞLU
10. Chemist Zerrin ERDEMGİL
11. Pharmacist Kadriye BENKLİ

2. The project as in progress during the work of the expert will create in TBAM, a basis for Research & Development in the creation and production of fragrances. The nucleus of a Fragrance R&D laboratory has been created on the basis of the standard samples (25 g. each) of all the basic raw materials required to initiate R&D work, supplied by the expert.

3. There are at the time of the mission, no units anywhere in Turkey to produce raw materials for fragrances required by the domestic industries such as soap and detergents. The problem resulting from this lacuna is that the entire demand of aroma chemicals is met by imports and also there is no domestic market for the locally produced essential oils. Also large sums of foreign exchange are being spent to import the requisite raw materials and fragrances from foreign sources. The problem can be solved easily by initiating the simultaneous establishment of an aroma chemicals manufacturing facility based on locally available raw materials supplemented by imports and also a fragrance blending facility, in turn, based on the aromatic chemicals thus produced and the existing locally produced essential oils.

The project as currently conceived is technically and economically incomplete without further steps in the direction of manufacturing aromatic chemicals and compounding of fragrances. Quick development and the dynamic economy in Turkey, seen everywhere as intensive activity amongst the people, will result in growing demand for detergents, soaps, cosmetics, toileteries, perfumes etc. This will encourage greater production of these goods

which will immediately create a market for fragrance compounds. TBAM has sufficiently well qualified personnel who can be picked up for appropriate training and eventually TBAM can become the technology bank for the entire range of fragrance related industries.

Therefore, the scope of the project should be extended or a third stage started which will include:

- a) setting up of pilot plant facilities for production of isolates and derivatives obtained from essential oils,
- b) setting up of a fragrance blending facility based on the local production of essential oils, isolates and derivatives, inclusive of the training of appropriate technical personnel,
- c) Technology transfer for aforementioned objectives should be initially arranged from appropriate consultants.

4. The project as existing on the date of the mission, can be taken to its logical and fruitful conclusion if the need to have technical personnel trained fully in olfactory techniques is realised and the requisite number of such personnel are properly trained and then appointed to fulfil the following roles.

- i) Quality control perfumer
- ii) Manufacturing perfumer
- iii) Creative perfumer

The sequential order for the achievement of this target should be as under:

- i) Establishment of the odour evaluation laboratory
- ii) Selection and training of the odour evaluation panel
- iii) Introduction of rigid quality control based on odour coupled with the usual wet chemical and GLC methods.
- iv) Selection from amongst the odour evaluation panel of the person with an aptitude for fragrance technology in all aspects and the training of such an individual so as to enable him/her to eventually start an integrated fragrance facility capable of quality control, routine manufacturing and creative blending.

5. The range of essential oil bearing plants /trees being currently grown in Turkey needs to be increased so as to include the species / varieties suggested by the expert so as to provide a wider and more viable base for the projected essential oils, aromatic chemicals and fragrance industry.

6. The aforementioned targets can be achieved by strengthening TBAM's facilities to give a better service to Fragrance & Flavour Industries in Turkey.

## **B . Recommendation**

1. TBAM and UNDP/UNIDO should consider extension of a scope of the project or its third phase so as to create the following facilities:

- a) Odour Evaluation and Olfactory Quality Control methods should be immediately introduced in TBAM to ensure that the goods produced by the Turkish Industry are of an olfactorily acceptable international quality so as to enable the country to face international competition.
- b) An Odour Evaluation Laboratory should thus be established immediately with the active involvement of the people trained by the Consultant who at the moment are the only people in TBAM with any grounding in the scientific methods of odour evaluation. This laboratory should be entrusted with the task of olfactory Quality Control of essential oils being produced by the Turkish Industry.
- c) This laboratory should in turn be expanded into a creative fragrance laboratory, after the staff has undergone systematic advanced training, preferably in Turkey itself with the help of the expert, as commercial companies abroad generally will not import useful training to a budding competitor.
- d) The Creative Fragrance Laboratory should actively co-operate with the essential oils fragrances and flavours manufacturing companies in Turkey and based on the locally produced raw materials such as essential oils and aroma chemicals help to create fragrances for consumption by Turkish companies manufacturing consumer goods incorporating fragrances.
- e) The production of Aroma Chemicals based on locally available raw materials and essential oils should be immediately established.
- f) The range of essential oil bearing plants/trees should be increased as suggested.
- g) The essential oil bearing plants/trees, flowers, spices etc. already being grown in the country should be taken up for distillation, so as to diversify the existing range of production and the variety of local raw materials required for the fragrance manufacturing facility.
- h) Based on the help provided by the expert and the subsequent work done by the Creative Fragrance Laboratory, a Fragrance Manufacturing Facility should be established.
- i) The technical personnel required to fulfil the aforementioned tasks should be trained in Turkey and be only sent abroad for exposure training. It should be borne in mind that no meaningful training can be provided to a potential competitor in any commercial organisation.
- j) The existing quality control facilities of TBAM based on instrumental and standard chemical methods of analysis combined with the newly developed Olfactory Quality Control and Sensory Evaluation Methods place the TBAM in a unique position in Turkey. As such it should be recognized as an affiliated laboratory of the Health Ministry and be authorised to issue Quality Assurance Certificates for

Fragrance/Flavour related industries for both imports as well as exports.

- k) Since TBAM has all the basic facilities for the production and quality control of essential oils and extracts from plants, with the addition of a few more equipment it can easily be turned into a technological base for R&D in Flavour & Fragrance industries in Turkey. With its able personnel and good background of knowledge, it can, in near future, serve as a technological bank for related industries provided UNDP/UNIDO support is extended to meet this goal.
- l) The concept of in plant training programmes organized on pilot plant processing and quality control procedures should be expanded so as to include fragrance technology work shops for participants from developing countries.
- m) An exhaustive survey of the requirements and needs of the fragrance and flavour industries of Turkey should be made so as to enable TBAM to develop its facilities accordingly.



**T. C. ANADOLU ÜNİVERSİTESİ TIBBİ BİTKİLER ARAŞTIRMA MERKEZİ  
ANADOLU UNIVERSITY MEDICINAL PLANTS RESEARCH CENTRE**

Ankaraya faks : 1271236

TO Mr.K.Hussein

4.1.1991

Dear Mr.Hussein,

Following is the work plan of Mr.Sudhir Jain during his mission in Eskişehir between 4-28 January 1991.

- ✓ 1. Short but detailed in-house course in fragrance formulation and sensory evaluation with special emphasis on creation (7 days)
- ✓ 2. Short course in perfumery for people already in the industry, with emphasis on commercial aspects of the industry while at the same time covering fragrance formulation and sensory evaluation (4 days).
- ✓ 3. Action plan for setting up of a fragrance formulation and sensory evaluation laboratory at TBAM.
- ✓ 4. Action plan for setting up of an aroma chemicals manufacturing facility at TBAM?
- ✓ 5. Preparation of a project proposal for strengthening TBAM's facilities to give a better service to flavour and fragrance industries in Turkey.

Sincerely,

Prof.Dr.K.H.C.Başer

Director

NPC-DP/TUR/88/001



## ANNEXURE 2

### TRAINING COURSE ON THE DEVELOPMENT OF LOCAL EXPERTISE IN THE COMPOUNDING OF FRAGRANCE MATERIALS AND ORGANOLEPTIC EVALUATION OF RAW MATERIALS AND RELATED PRODUCTS

In consultation with and under the direct guidance of Prof.Dr.K.H.C.Başer, National Project Director, and with the co-operation of the entire staff of TBAM, a detailed programme was implemented relating to the titled subject.

The programme of the training course was initiated by the elaborating on some of the theoretical aspects of olfaction and odour quality evaluation.

The salient points of the training course were as follows:

#### Theoretical:

1. Human and Animal Senses
2. Structure of Human Sense of Smell
  - a) Anatomy
  - b) Receptors-structure and position
  - c) Olfactory bulb, axons, nerves and grain
3. Odour Perception Mechanisms
  - a) Molecular structure of receptors ( $\alpha$ -helix)
  - b) Olfaction theories
4. Sensitivity of Odour Perception, minimum perceptible
  - a) Odour thresholds
  - b) Just noticeable difference
5. Personal Abilities of Human Olfaction Sense
  - a) Sensitivity
  - b) Odour memory
  - c) Odour association
  - d) Odour differentiation
  - e) Influence of personal condition (health, mood) on above abilities
6. Odour Description and Odour Classification
  - a) History of odour description methods
  - b) Methods of classification
  - c) Primary odours
  - d) Odour profiles
7. Odour Quality Evaluation
  - a) Direct comparison
  - b) triangle method
  - c) duo-trio method
  - d) quality comparative scale

After establishing in short, the theoretical background of the subject on the basis of the topics elaborated above, the practical side of the training was initiated by the expert on the basis detailed below:

1) **Fragrance-Industrial**

a) **Definition:** Any mixture of two or more odoriferous substances, of a type used in industry

- i) of a type used in food ..... FLAVOUR
- ii) all others ..... FRAGRANCES

Thus it was explained that for the purposes of the programme which was mainly concerned with the industrial use of fragrances and / or use of industrial fragrances, it was necessary to abide by the aforementioned definition which is now used internationally as per the Brussels Trade Nomenclature.

b) **Uses:** Since the programme was concerned with the use of industrial fragrances, the possible use of such products were explained and are listed below:

- i) **Household Products**
  - Soaps and Detergents
  - Cleansers
  - Disinfectants
  - Polishes
  - Paints
  - Adhesives
  - Air Freshners
- ii) **Personal Products**
  - Cosmetics: Make-up Products
  - Toilet and Beauty Preparations
  - Perfumes and Toilet Waters
- iii) **Industrial Products**
  - Dry Cleaning
  - Leather and Rubber Articles
  - Artificial Leather
  - Linoleum
  - Plastics
  - Printing Inks, Perfumed Board and Paper
  - Textiles

iv) Agricultural Products

Insecticides

Insect and Animal Repellants

Animal Baits and Attractants

Veterinary Products

Cattle Feeds

After detailing the uses of various fragrances, the major classes/categories into which fragrances can be divided were described and the same are detailed below:

1. Green
2. Fruity
3. Floral
4. Aldehydic
5. Leather, Woody and Mossy
6. Floral Bouquets
7. Chypre
8. Oriental
9. Eau de Cologne
10. Fougere

To explain the characteristic of each type of fragrance listed above, a set of commonly used raw materials was prepared and presented in the programme with detailed explanation of the odour picture of each item. The raw materials used are listed below:

1. Benzyl acetate
2. Phenyl ethyl alcohol
3. Bergamot oil
4. Coumarin
5. Resinoid labdanum
6. Resinoid Oakmoss
7. Patchouli oil
8. Vetiver oil
9. Vanillin
10. Amyl cinnamic aldehyde
11. Citronellol
12. Sandalwood oil
13. Lavender oil
14. Nerol
15. Linalol
16. Styrallyl acetate
17. Ylang ylang oil
18. Iso eugenol

19. Aldehyde C-12 MNA
20. Resinoid iris
21. Methyl ionone
22. Indole
23. Benzyl phenyl acetate
24. Hydroxy citronellal
25. Terpineol
26. Heliotropine
27. Anisic aldehyde
28. Cinnamic alcohol
29. Para cresyl phenyl acetate
30. Phenylacetaldehyde (59%)
31. Linalyl acetate
32. Petitgrain oil
33. Methyl antranilate
34. Aldehyde C-10
35. Geraniol
36. Dimethyl octanol
37. Guaiacwood oil
38. Ionone alpha
39. Phenyl acetic acid
40. Rose crystals
41. Aldehyde C-11
42. Methyl heptin carbonate
43. Ionone 100%
44. Benzyl iso eugenol
45. Aldehyde C-8
46. Aldehyde C-9
47. Aldehyde C-12 Lauric
48. Lemon oil
49. Lavandin oil
50. Fixolide
51. Costus oil
52. Birch tar oil
53. Resinoid castoreum
54. Isobutyl quinonine
55. Para tertiary butyl cyclohexyl acetate
56. Geranium oil
57. Phenyl ethyl acetate
58. Phenylacetaldehyde dimethyl acetal
59. Phenyl ethyl formate
60. Benzyl formate

Using only this basic set of raw materials the aforementioned fragrance categories were demonstrated, using the following typical formulations:

1. Green

hydroxycitronellal	100
phenyl ethyl acetate	20
phenylacetaldehyde 50%	30
phenylacetaldehyde dimethyl acetal	20
methyl heptin carbonate	5
benzyl acetate	20
phenyl ethyl formate	10
benzyl formate	10
terpineol	20
amyl cinnamic aldehyde	10
citronellol	5
methyl ionone	15

2. Fruity

benzyl acetate	15
bergamot oil	15
vanillin	15
ylang oil	30
petitgrain oil	10
methyl anthranilate	10
aldehyde C-10	5
lemon oil	10

3. Floral

i) Gardenia

nerol	30
linalol	20
bergamot oil	40
styrallyl acetate	20
ylang oil	50
iso eugenol	30
aldehyde C-12 MNA	1
benzyl acetate	40
amyl cinnamic aldehyde	20

ii) **Jasmine**

benzyl acetate	30
phenyl ethyl alcohol	10
resinoid iris	5
methyl ionone	5
indole	5
ylang oil	5
hedion	3
benzyl phenyl acetate	10
hydroxycitronellal	30
amyl cinnamic aldehyde	10
isoeugenol	6

iii) **Lilac**

jasmine	35
rose	150
terpineol	50
heliotropin	100
anisic aldehyde	5
cinnamic alcohol	50
hydroxycitronellal	300

iv) **Narcissus**

jasmine	100
nerol	15
para cresyl phenyl acetate	10
phenylacetaldehyde 50%	5

v) **Neroli**

linalol	250
terpineol	80
nerol	150
linalyl acetate	70
petitgrain oil	300
methyl anthranilate	50
hydroxycitronellal	50
amyl cinnamic aldehyde	40
aldehyde C-10 10%	5

vi) Rose

citronellol	300
phenyl ethyl alcohol	100
Geraniol	200
dimethyl octanol	100
guaiacwood oil	50
isoeugenol	10
ionone alpha	10
cinnamic alcohol	50
phenyl acetic acid	40
rose crystals	30
aldehyde C-11 10%	5

vii) Violet

benzyl acetate	100
bergamot oil	100
methyl heptin carbonate 10%	10
resinoid iris	40
methyl ionone	300
ionone alpha	150
ionone 100%	200
benzyl isoeugenol	40
ylang oil	20
jasmine	40

4. Aldehydic

aldehyde C-8	1
aldehyde C-9	2
aldehyde C-10	3
aldehyde C-11	2
aldehyde C-12 lauric	3
aldehyde C-12 MNA	2
bergamot oil	50
lemon oil	5
lavandin oil	30
fixolide	20
sandalwood oil	20

5. Leather

bergamot oil	10
patchouli oil	10
costus	2
birch tar oil	5

resinoid labdanum	10
resinoid castoreum	30
methyl ionone	5
isobutyl quinoline	1

Woody

aldehyde C-11 10%	5
vetivert oil	20
sandalwood oil	30
p-tert. butyl cyclohexyl acetate	30
ionone 100%	20
ionone alpha	10
patchouli oil	15
geranium oil	10

Mossy

resinoid oakmoss	100
coumarin	50
vetivert oil	5
lavender oil	15
nerol	15
linalol	15
phenylacetaldehyde (50%)	5
petitgrain oil	30
linalyl acetate	15
lavandin oil	30

6. Floral Bouquets

i) jasmine	50
rose	50
green	5
aldehyde	15
ii) rose	100
jasmine	50
violet	50
aldehyde	20
iii) lilac	100
violet	50
neroli	50



iv) jasmine	100
lilac	50
neroli	50

7. Chypre

benzyl acetate	20
phenyl ethyl alcohol	20
bergamot oil	30
amyl cinnamic alcohol	10
citronellol	10
coumarin	5
resinoid labdanum	5
resinoid oakmoss	10
patchouli oil	10
vetivert oil	5
vanillin	5

8) Oriental

jasmine	50
rose	30
bergamot oil	30
lavender oil	15
resinoid labdanum	15
resinoid oakmoss	15
patchouli oil	5
vetivert oil	5
sandalwood oil	20
vanillin	30
resinoid iris	5
ylang oil	30
methyl ionone	15
hydroxycitronellal	40
heliotropin	10
costus oil	5
aldehyde	20

9) Eau de Cologne

bergamot	100
petitgrain oil	100
lemon oil	30
lavender oil	30
lavandin oil	30
neroli	50
ylang oil	50

10) Fougere

benzyl acetate	20
phenyl ethyl alcohol	20
amyl cinnamic aldehyde	10
citronellol	10
coumarin	5
resinoid oakmoss	15
patchouli oil	10
sandalwood oil	5
vanillin	5
lavender oil	40

### ANNEXURE 3

#### METHOD FOR CREATION OF AN OLFATORY ASSESSMENT AND SENSORY EVALUATION LABORATORY FOR NATURAL SYNTHETIC PERFUMERY MATERIALS.

##### Background:

1. Natural and synthetic perfumery materials such as essential oils, aromatic chemicals, etc, are used primarily for their odour appeal. Although the analytical characteristics which are commonly determined may provide some assurance regarding the chemical purity of an odoriferous substance, they do not necessarily indicate the "purity" of odour. Hence, olfactory evaluation has been practised for centuries and, in the perfumery trade, it has formed the basis of acceptance or rejection of odoriferous materials.

This methodology has been formulated with a view to introduce standard methods of testing for olfactory assessment of natural and synthetic perfumery materials.

2. Olfactory assessment has been the target of some criticism as it is a subjective test. Numerous attempts on basic odour research and, more particularly, on objective measurement techniques have been made from time to time but none of these has so far wide acceptance. Whereas objective methods are the goal of all odour research, there is, at present, no technique which may replace sensory detection and evaluation of odours.

##### Terminology

1. **Top note:** The initial and primary odour effect perceived by the olfactory nerves on smelling a strip freshly impregnated with the material being tested. The top note(s) is (are) usually of a short duration and may or may not be co-perceived along with the middle note.

2. **Middle note:** The secondary overall odour effect experienced by the olfactory nerves on smelling a strip impregnated with the material after the initial top note has evaporated. It lasts for a longer time on the strip than the top note.

3. **Residual note (Dry-out Note):** The tertiary odour effect experienced by olfactory nerves on smelling a strip impregnated with a material after the top and the middle notes have disappeared. Besides indicating the lasting character and strength of the material, it may also reveal the nature of the lesser volatile materials.

4. **By note:** An odour effect, additional to the normal pattern of odours associated with the material, experienced by olfactory nerves on smelling an impregnated strip during any stage of evaporation. It is generally regarded as an index of foreign odour and/or undesirable adulterant and alien.

5. **Odour Description:** Due to the absence of precise terms, descriptive words which are subjective in nature are commonly used to express the odour sensations perceived in the top, middle, residual and by-notes. Some of these terms are given below but the list is not intended to be exhaustive:

acid  
acrid  
aldehydic  
amber  
animal  
balsamic  
bitter  
burnt  
camphoraceous  
choking  
citrus  
cloying  
cool  
dry  
dull  
earthy  
exalting  
faecal  
fatty  
fishy  
floral  
fungal  
fresh  
fruity  
goaty  
grassy  
green  
heavy  
herbal  
honey  
intense  
leafy  
leathery  
minty  
mossy  
mushroomy  
musky  
musty  
nauseating  
nutty  
oriental  
peppery  
persistent

phenolic  
piney  
powdery  
pungent  
refreshing  
sappy  
sharp  
sickly  
smokey  
sour  
spicy  
stemlike  
still odour  
sulphuraceous  
sultry  
sweet  
tarry  
tart  
woody

### **Requirements**

**General Requirements:** The following general precautions are required to be noted.

*Selection and Training:* Better results are obtained if individuals with a keen sense of smell and ability to distinguish between different odours are selected for training in olfactory assessment.

*Fatigue:* Continuous smelling causes olfactory fatigue and decreases critical odour perception. To avoid this, the number of samples assessed during a session should be limited as far as is practical. Further, during smelling, the body should be relaxed. Resting for an interval between smelling different samples is also advantageous. If the number of samples to be tested is fairly large, it is advisable to examine last those materials which are known to be pungent or strong in odour.

It should be borne in mind that inability to correctly identify certain odours may arise from natural deficiencies such as specific anosmia. For instance, some people are unable to perceive musky odour.

*Bias:* The necessity of minimizing all differences between samples other than that of odour in order to prevent the prejudicing of results is stressed. 'Blind' tests should be conducted by ensuring that the markings on the smelling strip do not disclose the origin of the samples.

*Time of Olfactory Assessment:* The evidence relating to the most favourable time for conducting olfactory assessment is somewhat conflicting. However, the morning appears to be generally favoured. In general, olfactory assessment should be done after a reasonable interval of time has elapsed after a meal or a beverage has been taken.

*Freedom from Contaminating Odours:* It is necessary to ensure that the hands, nose and smelling strips are free from contaminating odours as these are likely to vitiate the results. It is recommended that the individual responsible for assessing odour should wash his/her hands several times during a smelling session as well as clear his /her nose.

*Material Requirements:* The following materials, apparatus and environmental conditions are required.

*Library of Standard Samples:* For each essential oil, aromatic chemical or other perfumery material, there shall be a standard sample of approved odour value.

The standard samples shall be kept in well-stoppered, air-tight, neutral amber-coloured glass bottles and when not in use, they shall be stored in a refrigerator at about 5°C.

The odour characteristics of standard samples are likely to change over a period of time however well they may be stored. Some materials improve in odour as a result of maturing while others deteriorate because of minute oxidative changes. An alteration in the odour characteristics of standard samples is not desirable and, in such cases, fresh standards should be adapted. Generally, all perfumery materials recommended shelf life and the sample should be changed thereafter.

*Ethyl alcohol:* Perfumery grade.

*Diethyl Phthalate:* Perfumery grade.

*Smelling strips:* These shall preferably be 1 cm wide and 15 cm long. They shall be made from odourless, thin, absorbent paper and shall be sufficiently stiff so that the strips do not bend under their own weight when held in a horizontal position.

Absorbent paper of substance ranging from 100 to 280 g/m<sup>2</sup> is commonly used. Paper is made entirely from the best cotton material, and is usually in the form of cotton or linnen fibre or a mixture of both. It should be free from any trace of chemicals. Also the water used in making such paper should be pure and completely free from odours, chemicals or salts. The paper should be neutral and should have been kept away from odorous materials and environment all the time. These considerations should be useful in evaluating the quality of the paper used for preparing smelling strips.

Smelling strips shall be packed in air-tight, odour-free containers and stored in a clean odour-free room. Those intended for daily use shall preferably be kept in a wide-mouthed glass bottle covered by a beaker.

*Strips Stand:* A cruciform patterned 3-clip stand, approximately 21 cm high, or any other suitable device, to hold impregnated smelling strips.

*Environment:* A well-ventilated room, as free as possible from all outside disturbances. Ideally, the temperature and humidity suited are about 20°C and 80 percent RH (Relative Humidity), respectively. The colouring of the room shall be sober and the furnishing restricted. The general environment shall have a restful rather than a distracting effect.

### **Procedure**

One end of each smelling strip shall be clearly marked before use. Dip the unmarked end of one strip (about 0.5 to 1.0 cm) in the material under examination and of another strip to the same depth in the standard sample after it has attained room temperature. For certain perfumery materials, such as fatty aldehydes, absolutes and solids, use 1 to 10 percent solutions in ethyl alcohol or diethyl phthalate for olfactory assessment.

For semi-solids, solids and strong-smelling substances, use the procedure as given below.

*For semi-solid materials:* The odour of semi-solid materials such as guaiacwood oil, oakmoss resinoid and absolute, labdanum resinoid and absolute, etc, should be taken on smelling strips but only after melting the contents completely under controlled temperature below 100°C preferably on water-bath.

*For strong smelling materials:* In order to have a better perception, strong smelling substances irrespective of their physical appearance may also be smelt after dilution to about 1 to 10 percent such as indole, fatty aldehydes, etc, using ethanol or diethylphthalate as a diluent.

Hold the strip impregnated with the standard sample at such a distance from the nose that there is incipient yet distinct perception of odour. While smelling, concentrate wholly on the sensations received and make mental observations. Repeat the procedure with the strip impregnated with the test sample. After about a minute's rest, repeat the comparison reversing the order of smelling the two strips. Finally, compare the two strips for their odour in a "blind" test. If a difference in odour is observed, repeat the "blind" test on the two strips five times. Record the observations of each "blind" test.

It is important to note that although the room shall be well-ventilated, the strips kept under examination should not be exposed to a direct draught.

After this initial assessment for top notes, fix the two strips on a stand keeping them sufficiently apart to avoid inter-contamination. Examine the strips periodically by the "blind" test and note the changes in quality and intensity of odour. Continue in this manner as long as the odour on each strip remains perceptible.

## **Report**

Report the top, middle and residual odour assessment of the test sample as compared with the odour of the standard sample at corresponding stages of assessment.

Criterion for Judgement of Quality: The odour of the material under examination shall correspond to that of the standard at all stages of assessment. If it does not and the pattern of odour is considered to be inferior to that of the standard, the quality of the material shall be regarded as not satisfactory.

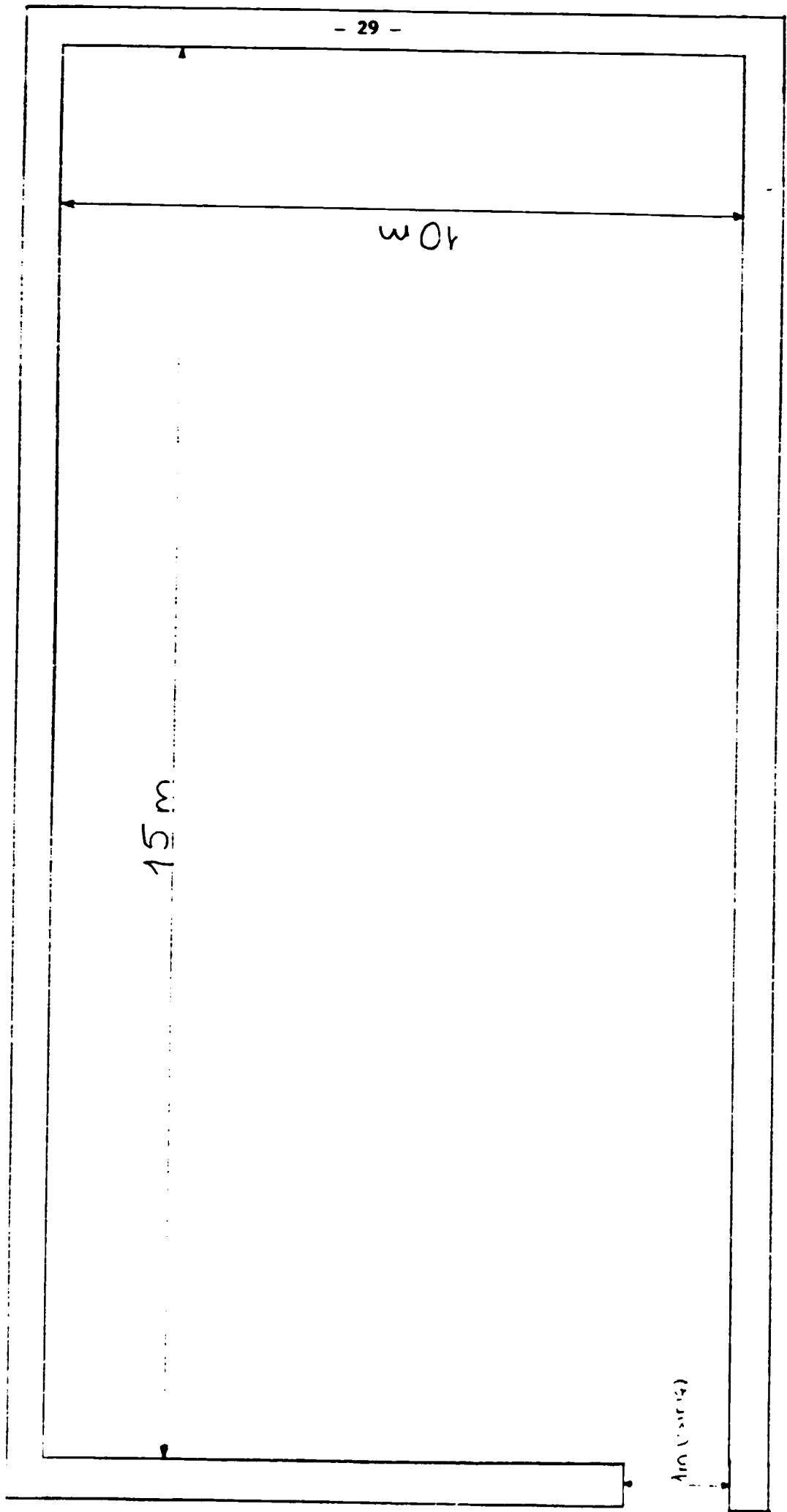
Referee Test: In case of dispute, present the individual assessing odour with three suitable coded smelling strips, two of which have been dipped in the material under examination and the remaining one in the standard sample (or *vice-versa*). If the 'odd' sample is consistently picked five times in a 'blind' test, the material shall be deemed to have a pattern of odour different from that of the standard sample.

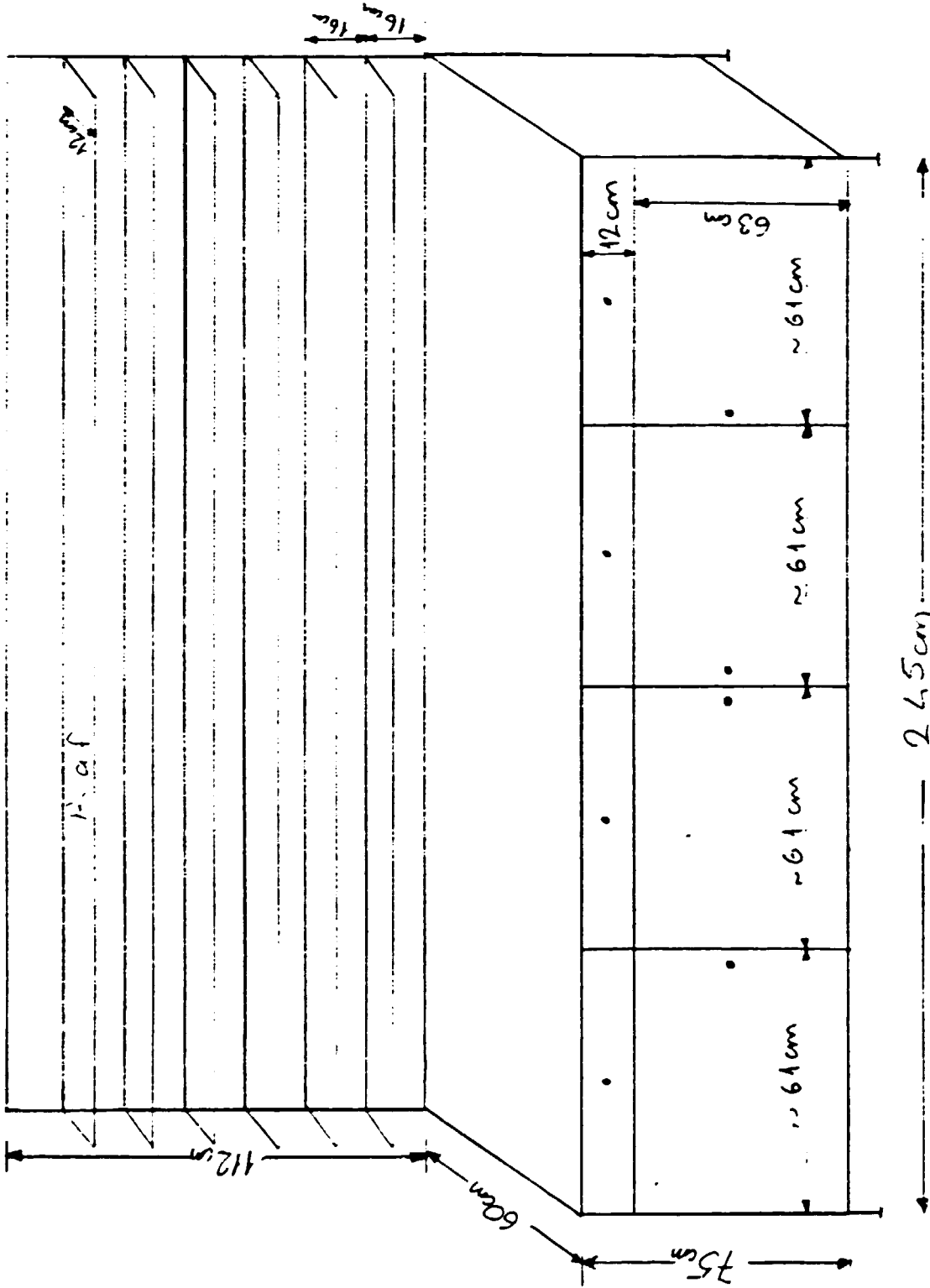
## **DETAILS OF FACILITIES REQUIRED IN THE SENSORY EVALUATION AND FRAGRANCE CREATION LABORATORY**

1. Refrigerated storage of standard samples of raw materials and finished products.
2. Samples of raw materials in bottles of proper design for daily working.
3. Weighing balances of accuracy to third decimal place.
4. Magnetic stirrer and heater.
5. Water bath
6. Working tables with shelves up the eye level.
7. Efficient exhaust and ventilation system
8. Wash basin
9. Conical flasks, beakers, pipettes, droppers, funnels and aluminium foil.
10. Detached smelling room free from all odours for odour evaluation fitted with an efficient exhaust and filtered air inlet system.



LAEURAHUWIR BINALI





Yapım malzemesi: Sunta (Fildisi formika kaplanmış)

## ANNEXURE 4

### GLOSSARY OF TERMS RELATING TO NATURAL AND SYNTHETIC PERFUMERY MATERIALS

In the preparation of this glossary, most of the terms currently in use in natural and synthetic perfumery trade and industry together with their synonyms and more common terms in vogue internally and also in other countries have been included.

#### Terminology

1. **Absolutes:** An ethanolic extract of a concrete or a resinoid which contains the maximum concentration of odoriferous components and is free from natural waxes and/or any solvent used in the processing.
2. **Acid Value:** It is numeric value equivalent to the number of milligrams of potassium hydroxide required to neutralize the free acids present in 1 g of the material.
3. **Alcohol Perfumery Grade, Denaturated:** Rectified ethyl alcohol, specially denatured for perfumery industry, and by the addition of denaturants it thus not at any undesirable by-odours to it.
4. **Aldehydic Blend:** See 13
5. **Amber Note:** A heavy full-bodied warm ambergriss like note.
6. **Animal Note:** Odours or notes with a sensuous character.
7. **Aromatic Chemicals/Aroma Chemicals:** Organic chemicals derived by organic synthesis or as isolate from natural essential oils possessing distinct aroma. Used as raw material for the preparation of perfumery blends or flavours.
8. **Aromatic Plants:** See 92
9. **Aromatic Water:** Aqueous odoriferous condensate of hydro-distilled and/or steam-distilled material of vegetable origin containing fully dispersed essential oil.
10. **Attar (Indian):** A perfume concentrate characteristic of single flower or a mixture of flowers and/or other materials of plant or animal origin with oil of sandalwood as the base.
11. **Balsam:** An odoriferous exudate from plants/trees which flows naturally or is artificially induced by incision.
12. **Blend:** Harmonious combination of two or more odouriferous materials.
13. **Blend Aldehydic:** Blend deriving their unique character from the predominance of aldehydic notes.
14. **Blend, Cologne:** Any harmonious combination of fragrances, the main characteristics of which are derived from citrus oils.
15. **Blend, Oriental:** A blend with heavy, full-bodied sweet balsamic and animal note.
16. **Blend, Spicy:** Any fragrance combination having spicy overtone.
17. **Blend, Woody:** Any fragrance dominated by a woody character.

18. **Body:** Main fragrance theme.
19. **Boiling Range:** See 40
20. **Bouquet:** Generally a harmonious combination of two or floral notes.
21. **By-Note:** A temporary or permanent odour effect additional to the main pattern of odour effect additional to the main pattern of odour associated with the material.
22. **Carbonyl Value:** It is numerically equivalent to the number of milligrams of potassium hydroxide, that is, equivalent to the amount of hydroxylamine required to oximate the carbonyl compounds present in 1 g of material.
23. **Cell:** A unit of the plant tissue
24. **Cellular:** Composed of cells.
25. **Chypre:** A mossy-woody fragrance, complex with a characteristic sweet citrus top note, frequently encompassing some floral tones.
26. **Citrus:** Odours reminiscent of citrus fruits, such as orange, lemon, bergamot, grapefruit, etc.
27. **Cologne:** Name used traditionally for solution of citrus perfume blends in aqueous ethanol (also see 113).
28. **Cologne Blend:** See 14
29. **Concentration:** See 94
30. **Concentrated Perfume:** See 86
31. **Concrete:** A material derived from a single source of vegetable or animal origin by extraction with a suitable solvent. It generally contains non-odouriferous constituents, such as waxes, coloring matter etc, in addition to odoriferous components and is free from any solvent used in the process.
32. **Condensate:** Vapours that have been condensed .
33. **Condenser:** Part of distillation apparatus where the hot vapours are cooled and condensed for recovery.
34. **Congeeing Point:** It is the maximum constant temperature at which liquefied solid resolidifies.
35. **Deterpenized Oil:** Natural essential oils which are free from terpenes and/or sesquiterpenes.
36. **Diffusion:** The ability of a fragrance to radiate and permeate the environment.
37. **Distillation:** A process of evaporation and recondensation used for purifying liquids.
38. **Distillation, Dry:** Distillation of semi-solid and solid materials in the absence of steam, water, or any other solvent.
39. **Distillation, Hydro:** Distillation of a substance carried out by indirect contact with boiling water.
40. **Distillation Range:** It is the range of temperature within which a specified percentage of the material distils.
41. **Distillation Steam:** Distillation of a substance by passing steam through it.
42. **Distillation, Vacuum:** Distillation of a substance under reduced pressure.
43. **Distillation, Water:** See 39.

44. **Dry Distillation:** See 38.
45. **Dry Out:** Final phase of the main fragrance after the main volatile constituents have evaporated.
46. **Enfleurage:** Process of extracting fragrance of fresh flowers by intimate contact with mixture of purified fats preferably at low temperatures.
47. **Essential Oil:** It is volatile perfumery material derived from a single source of vegetable or animal origin by a process, such as hydrodistillation, steam distillation, dry distillation or expression.
48. **Essential Oil, Synthetic:** It is a composition generally consisting of natural essential oils, aromatic chemicals, resinoids, concretes, absolutes, etc. but excluding animal or vegetable non-essential oils and not having a non volatile residue in excess of 10 percent by mass. It is so composed that it bears a close resemblance primarily in odour to a naturally occurring essential oil.
49. **Ester Value:** It is numerically equivalent to the number of milligram of potassium hydroxide required to neutralize the acids liberated by the hydrolysis of the esters present in 1 g of the material. It represents the difference between the saponification value and the acid value of the material.
50. **Ester Value After Acetylation:** It is numerically equivalent to the number of milligrams of potassium hydroxide required to neutralize the acids liberated by the hydrolysis of 1 g of acetylated material.
51. **Evaporation Residue:** Represents the percentage of perfumery material which is not volatile when heated on a steam-bath under specified conditions.
52. **Expression:** The process of extracting essential oil from the plant cells by application of mechanical pressure.
53. **Extract:** A concentrated product obtained by treating a natural perfumery material with a solvent which is subsequently evaporated.
54. **Extraction:** The process of isolating essential oil with the help of a volatile solvent.
55. **Extrait, Alcoholic:** A French word, now universally used in perfumery, meaning an alcoholic extract of odorous parts of a pomade. It is generally used to mean alcoholic solution of a perfume concentrate.
56. **Fixative:** A substance which is compatible with and provides body and substantivity and rounds off a perfume composition by regulating the rate of evaporation of its volatile constituents.
57. **Flavour:** A combined organoleptic sensation of aroma and taste in a flavouring material is also called a flavour.
58. **Floral:** The fragrance characteristic of an existing known flower type.
59. **Fore Runnings:** Initial fractions of the distillate obtained during a distillation process.
60. **Fougere:** Perfume composition having a citrus/lavender top note with sweet powder rosaceous body with mossy/woody background.

61. **Fractionation:** The process of distillation by which an essential oil is separated into various fractions.
62. **Fruit Flavour/Essence:** Suitably blended mixtures of flavouring materials, permitted chemicals and food colours, in a solvent medium of either ethanol or the permitted non-alcoholic solvents.
63. **Fruity Note:** The impression of fruit odours within the fragrance theme.
64. **Full Bodied:** A well-rounded-out fragrance that possess depth and substantivity.
65. **Green Note:** Notes that recall fresh-cut grass, leaves and stems or other parts of plants.
66. **Gum:** A natural water soluble anionic material, often of glycoside-like structure and of high molecular mass which collects in or exudes from certain plants. It forms neutral or slightly acidic solution or a sol with water and has a typical mild odour.
67. **Gum Resin:** Natural exudation from plants and trees consisting of gums and resin with very small amounts of essential oils.
68. **Harmonius:** Order, accord and symphony in a fragrance.
69. **Heavy:** Oriental balsamic as against floral/green.
70. **Hydro Distillation:** See 39
71. **Infusion:** A process of treating a substance with water or organic solvent
72. **Isolate:** Either a single constituent or a multi-component fraction or a composited fraction, rich in desired odoriferous components and derived from a natural perfumery material.
73. **Lasting Qualities:** The ability of a fragrance to retain its character over a given period of time.
74. **Leathery Note:** Any fragrance conveying the dominant characteristic of tanned leather.
75. **Melting Point:** The temperature at which the material melts and becomes liquid throughout as shown by the formation of a definite meniscus.
76. **Melting Range:** The range between temperatures at which the material begins to form droplets and at which it becomes liquid throughout.
77. **Middle Note:** The main overall odour effect experienced by olfactory nerves on smelling a strip impregnated with a material and exposed to the atmosphere for some time.
78. **Mossy Note:** The notes that recall to mind moist dark forest having moss on the trees.
79. **Natural Perfumery Materials:** Perfumery materials of natural origin.
80. **Odour:** That property of a substance which stimulates and is perceived by the olfactory sense.
81. **Oleoresin:** Exudations from tree trunks or barks of trees and are characterized by the fact that these consist of entirely or mainly resin accompanied with an essential oil in varying percentages, soluble in organic solvents.
82. **Oleoresin Gum:** An exudation from plants mainly consisting of essential oil, resin and gum.

83. **Oleoresin, Spice:** Extractables of spice having resin and essential oil obtained by solvent extraction.
84. **Oriental Blend:** See 15.
85. **Perfume:** A solution of perfumery compound/compounds in ethanol or other suitable solvents meant for use as a personal adornment. Here ethanol or other suitable odourless solvents are used as carriers for the fragrances.
86. **Perfume Concentrate:** A non-alcoholic concentrated perfume blend.
87. **Perfumery Compound:** A concentrated base which is further diluted with or without toning and further modifications to suit various end-uses.
88. **Perfumery Grade Alcohol:** See 3
89. **Perfumery Material:** A naturally occurring substance, or a derived material, or a preparation obtained by physical and/or chemical means, which diffuses or imparts an odour or a flavour.
90. **Perfumery Materials, Natural:** See 79.
91. **Perfumery Materials, Synthetic:** See 107.
92. **Plant, Aromatic:** Plant bearing a characteristic aroma.
93. **Pomade:** Refined and deodorized animal fat (s) saturated with volatile oils present in and exhaled from the flowers especially the rose and the jasmine.
94. **Rectification:** Method of separation of undesirable substance to improve the quality of the materials.
95. **Relative Density:** The ratio of density of material at 27°C to that of distilled water at 27°C or 4°C when all masses are made in air is called relative density at 27°C or 4°C. Originally, it was known as specific gravity.
96. **Residual Note (Dry Out Note):** An odour effect experienced by olfactory nerves on smelling a strip impregnated with a material and exposed to the atmosphere for a period of time when the top and the middle notes have disappeared.
97. **Resin:** Solid or semi-solid translucent exudation from trees of plants. These are soluble in organic solvents.
98. **Resinoid:** A semi-fluid or a solid material obtained from a single resinous source of vegetable or animal origin by extraction with a suitable solvent and is free from solvent used in the process.
99. **Saponification Value:** It is numerically equivalent to the number of milligrams of potassium hydroxide required to neutralize the free acids liberated by hydrolysis of the esters present in 1 g of the material. It represents the sum of acid value and ester value.
100. **Saponification Value After Acetylation:** It is numerically equivalent to the number of milligrams of potassium hydroxide required to neutralize the free acid and the acids liberated by hydrolysis of the esters present in 1 g of the acetylated product.
101. **Sesquiterpene:** Term denoting a hydrocarbon composed of one-and-a-half terpene units, a single terpene unit being equal to two isoprene units.

- 102.Sesquiterpeneless Oil:** An isolate obtained by suitably removing the sesquiterpenes ( $O_{15}H_{24}$ ) from an essential oil.
- 103.Specific Gravity:** See 95.
- 104.Spice Oleoresin:** See 83.
- 105.Spicy Blend:** See 16.
- 106.Steam Distillation:** See 41
- 107.Synthetic Perfumery Materials:** Man-made single perfumery materials, by chemical processes.
- 108.Tail Running:** The last fraction of distillate obtained in a distillation process.
- 109.Terpeneless Oil:** An isolate obtained by removing almost all monoterpenes ( $C_{10}H_{16}$ ) from an essential oil.
- 110.Thin:** The lack of body, richness and substantivity.
- 111.Tincture:** A cold alcoholic extract of the soluble part of a natural fragrant material of vegetable or animal origin, the solvent being left in the extraction as a diluent.
- 112.Tissue:** Plant structure composed of cells.
- 113.Toilet Water:** See 27.
- 114.Top Note:** The first odour effect experienced by olfactory nerves on smelling a strip freshly impregnated with a perfumery material.
- 115.Vacuum Distillation:** See 42.
- 116.Vacuum Distillation Residue:** It is the percentage of material left behind undistilled when a known quantity of the material is distilled in vacuum at specified temperature and pressure.
- 117.Volatile:** A material is said to be volatile when it has the property of evaporating at room temperature when exposed to atmosphere.
- 118.Water Distillation:** See 39.
- 119.Woody Blend:** See 17.
- 120.Woody Note:** The impression of wood or woody odours within the fragrance theme.



## ANNEXURE 5

### ASSESSMENT OF POTENTIAL AND ACTION PLAN FOR SETTING UP AN AROMA CHEMICALS MANUFACTURING FACILITY AT TBAM TO SERVICE THE TURKISH INDUSTRY

#### **Definition of Aroma Chemical:**

Single defined chemical compounds with odour and/or flavour properties inclusive of mixtures of isomers or compounds of related structures. Such aroma chemicals are used on the basis of the odour/flavour characteristics and need not necessarily be free from by-products arising during production.

#### **Use of Aroma Chemicals:**

These are not intended for use on their own but are blended together in defined proportions along with natural raw materials such as essential oils, absolutes, concretes and resinoids but not necessarily so, to produce fragrances and flavours which find use in a host of household, personnel and industrial products.

For details see annexure 2.

#### **Present Status of the Industry in Turkey:**

Household, personnel and industrial products: All the products listed in Annexure 2 are made in Turkey.

Demand is forecast to grow in the 90's.

Fragrance and flavour industries: There are only four or five indigeneous Turkish units meeting a part of the total demand for such products.

Role of multinational units: Because of the lack of local units in this business such units corner a large share of the total market.

Handicaps in the growth of local industries: No raw materials worth the name, intended for use in the fragrance and flavour industries, are produced in Turkey.

*Consequences thereof:* Local manufacturers of Fragrances and Flavours are deprived of easy access to basic raw materials and are thus put to a disadvantage vis-a-vis the multinational manufacturers who have their own captive factories for raw materials. Also since these companies are more interested in selling fragrances and flavours, the raw materials that are offered for sale are offered exorbitantly high prices to deter other manufacturers from entering this field.

The growth of local industry is throttled by the multinational companies.

**Steps required to be taken to remove the aforementioned handicaps:**

1. A research and development cum production centre for aroma chemicals required by the fragrance and flavour industries should be set up to service the Turkish industry.
2. The variety of raw materials that can be produced in Turkey and for which the know how can be developed with the help of international experts should be identified.
3. The variety of basic chemicals readily available in Turkey that can be utilised for the production of the requisite aroma chemicals should be identified.
4. A suitable research centre to undertake the research and development CUM production work should be identified.

**Steps already taken to fulfill the aforementioned tasks:**

1. The Research and Development Centre has been identified, namely, The Anadolu University Medicinal Plants Research Centre.  
For details see Annexure 6.
2. The variety of raw materials that can be produced in Turkey has been defined.  
For details see Annexure 7.
3. The variety of basic chemicals available in Turkey has been listed.  
For details see Annexure 8.

**Steps remaining to be taken:**

1. The research centre has to develop the required process know how or acquire the same from experts under DP/TUR/88/001.
2. The required production facilities have to be set up.  
For details of equipment required see annexure 9.

**Related benefits likely to accrue to Turkey due to the establishment of the aforementioned facilities:**

1. Establishment of a new pioneering industry directly leading to the introduction of new technology.
2. Generation of new employment opportunities in both the industrial as well as the agricultural sectors.
3. Production of import substitution items.
4. Creation of market for locally produceable raw materials.

## **ANNEXURE 6**

### **DETAILS OF THE RESEARCH AND DEVELOPMENT CUM PRODUCTION CENTRE FOR AROMA CHEMICALS. A RESUME OF THE ACTIVITIES OF THE ANADOLU UNIVERSITY MEDICINAL PLANTS RESEARCH CENTRE**

#### **History**

Anadolu University Medicinal Plants Research Centre was set up in 1982. The project DP/TUR/83/003 "Production of Pharmaceutical Materials from Medicinal and Aromatic Plants" funded as part of an agreement between the Turkish Government and UNDP/UNIDO has enabled the Centre to greatly extend its facilities. On 19 November 1986, the President of Turkey, Kenan Evren, officially opened the building, thereby marking a new era in the activities of the Centre.

Following successful completion of the above mentioned project, the 2nd phase project DP/TUR/88/001 has started in 1988.

The Centre has been organizing a group training programme titled "Training in Utilization of Medicinal and Aromatic Plants in Pharmaceutical & Related Industries" (TRUMAP) since 1988 in Eskişehir under the auspices and joint sponsorship of UNIDO and the Government of Turkey.

This 20-day programme has become a regular training activity of the centre aimed at participants from developing countries.

The Centre has also successfully implemented the project SI/TUR/ 88/803 "Assistance to the Laurel oil Factory, Silifke, İçel" for the rehabilitation of a semi-installed, non-functional Laurel oil Factory designed to produce essential oil from Laurel leaves and fixed oil from Laurel berries.

The Centre is represented by its director in the following commissions: Turkish Pharmacopoeia Commission and Herbal Medicine Clinical Advisory group of the Drug Licencing Advisory Commission at the Ministry of Health. The Centre is also the national point of contact in Turkey for SCAMAP (South and Central Asian Medicinal and Aromatic Plants) network of UNESCO.

#### **Objectives**

The Centre undertakes research and development work, including pilot plant studies, relating to the industrial processing and quality control of plant raw materials used by various industries in the preparation of pharmaceuticals, foods, cosmetics, dyes, etc. Through its work in evaluating the flora of Turkey, the Centre contributes to a rational exploitation of the plant resources of the country and to a healthy development of the industries mentioned. The Centre also runs a variety of courses for people from these industries who require training in pilot-plant and quality -control work.

### **Some R&D project completed**

- Production and quality control of *Gypsophila* saponin, *Capsicum oleoresin*, Liquorice extract, saponins from *Ruscus aculeatus*, aescun from *Aesculus hippocastanum*, fixed oil from *Laurus nobilis*, essential oils from *Laurus nobilis*, *Salvia triloba*, *Salvia sclarea*, *Origanum onites*, *Mentha piperita*, *Mentha spicata*, *Melissa officinalis*, *Rosa damascena*, etc.
- Improvement of quality and quantity of rose oil production.
- Purification and quality control of Levant storax.
- Fractionation and quality control of orange peel oil.
- Design, fabrication and commissioning of 100 L and 500 L s/s fractional distillation plants, 2000 L steam distillation plant, 80 L s/s Buchner type filtration unit, 3x1500 L s/s battery of percolators.
- Rehabilitation of a Laurel oil factory in Silifke, İçel.

### **Publications**

1. "Bulletin of Medicinal and Aromatic Plants", quarterly, Turkish, 1st issue appeared in April 1989.
2. "Acta Planta Medica Anatolica", six monthly, English, 1st issue will appear in 1991.

### **The service offered TBAM are**

1. Consultancies
2. Project design
3. Process development
4. Design engineering
5. Survey, assessment and rehabilitation of sick phytochemical & pharmaceutical units
6. Feasibility studies
7. Quality assurance service
8. Analytical control
9. Research and Development
10. Production
11. Training.

## **Departments**

1. **Phytochemical Laboratory**
2. **Analytical Laboratory**
3. **Instrumental Laboratory**
4. **Multi-purpose Pilot Plant**
5. **Library and Documentation/Information Section**

In addition, there are full support services available in the Centre and from the University.

In near future, a Pharmacological Screening Laboratory and a Biotechnology Unit will also be established.

## **Personnel**

The Centre has a technical staff of 20 comprising pharmacists, chemists, chemical engineers and technicians. The Centre can also call on the services of national and international experts.

## **Facilities**

Plant materials are first dealt with at the phytochemical laboratory in order to establish process parameters which will eventually help in designing the scale-up work.

Analytical laboratory is equipped with modern equipment such as GLC, HPLC, TLC Scanner, UV- IR- GC-MS, refractometer, polarimeter, etc. Hence chromatographic and spectroscopic methods are heavily used for process control, quality control of raw materials and finished products as well as research and development.

Pilot plant facilities include multipurpose pilot plant, pilot and semi-industrial scale equipment for extraction, distillation, steam distillation, fractional distillation, chemical reaction, filtration, evaporation, centrifugation, drying and freeze-drying. These facilities are used for scaling-up of bench scale processes as well as technology adaptation and/or technology development work.

The Centre has created two data bases for quick storage and retrieval of data concerning plants of Turkey. Linkages with international data bases have also been established.

## ANNEXURE 7

### LIST OF THE VARIETY OF RAW MATERIALS THAT CAN BE PRODUCED IN TURKEY

#### For fragrances

1. citronellal
2. citronellol
3. dimethyl octanol
4. citronellyl acetate
5. citronellyl butyrate
6. citronellyl formate
7. citronellyl valerate
8. geraniol
9. geranyl acetate
10. geranyl butyrate
11. geranyl formate
12. geranyl propionate
13. geranyl valerate
14. citral
15.  $\alpha$ -ionone
16. ionone pure
17. methyl ionone
18. menthol
19. eugenol
20. isoeugenol
21. acetyl isoeugenol
22. linalol
23. linalyl acetate
24. terpineol
25. terpenyl acetate
26. isobornyl acetate
27. isoborneol
28. camphor
29. borneol
30. isobornyl cyclohexanol
31. hydroxycitronellal
32. para cresyl acetate
33. para cresyl methyl ether
34. para cresyl phenyl acetate
35. aldehyde C-16

#### For flavours

1. ethyl acetate
2. ethyl formate
3. ethyl propionate
4. ethyl butyrate
5. ethyl valerate
6. ethyl caproate
7. ethyl heptate
8. ethyl caprylate
9. ethyl pelargonate
10. isopropyl cinnamate
11. isobutyl acetate
12. allyl caproate
13. allyl caprylate
14. aldehyde C-20
15. amyl formate
16. amyl acetate
17. amyl butyrate
18. amyl alcohol
19. isobutyl valerate
20. amyl valerate
21. ethyl salicylate
22. ethyl benzoate
23. isopropyl valerate
24. amyl propionate

36. aldehyde C-14
37. yara yara
38. nerolin bromelia
39. rose crystals
40.  $\alpha$ -amyl cinnamic aldehyde
41.  $\alpha$ -hexyl cinnamic aldehyde
42. cinnamic aldehyde
43. cinnamic alcohol
44. phenyl propyl alcohol
45. benzyl acetate
46. benzyl formate
47. benzyl propionate
48. benzyl butyrate
49. benzyl salicylate
50. benzyl benzoate
51. benzyl phenyl acetate
52. benzaldehyde
53. phenyl acetic acid
54. amyl phenyl acetate
55. isobutyl phenyl acetate
56. ethyl phenyl acetate
57. methyl phenyl acetate
58. styrallyl alcohol
59. styrallyl acetate
60. phenyl ethyl alcohol
61. phenyl ethyl acetate
62. phenyl ethyl formate
63. phenyl ethyl isobutyrate
64. acetyl longifolene
65. isolongifolene ketone
66. methyl cinnamate
67. methyl salicylate
68. amyl salicylate
69. isobutyl salicylate
70. nerol

Since these chemicals form the greater part of any fragrance or flavour compositions, the start up of indigenous manufacture of these chemicals will immediately satisfy more than 50% of the demand for raw materials by the Turkish Industry.

## ANNEXURE 8

### LIST OF THE BASIC CHEMICALS AVAILABLE IN TURKEY

plus list of other raw materials required

1. aluminium isopropoxide
2. aluminium chloride
3. amyl alcohol
4. acetaldehyde
5. acetic anhydride
6. acetic acid glacial
7. acetophenone
8. acetone
9. barium hydroxide
10. benzene
11. benzyl chloride
12. benzoic acid
13. n-butanol
14. diethanolamide
15. ethyl alcohol
16. diethylene glycol
17. ethylene oxide
18. formic acid
19. phosphoric acid
20. iso butanol
21. isopropyl alcohol
22. caprylic acid
23. chlorine
24. chloroform
25. para cresol
26. methanol
27. methyl ethyl ketone
28.  $\beta$ -naphthol
29. potassium hydroxide
30. propionic acid
31. salicylic acid
32. citral
33. sodium acetate
34. sodium benzoate
35. sodium bicarbonate



36. sodium hydroxide
37. sodium chloride
38. sodium salicylate
39. sodium cyanide
40. sulphuric acid
41. turpentine oil
42. titanium dioxide
43. toluene
44. p-toluene sulphonic acid
45. castor oil

The other raw materials required for the production of aroma chemicals are as under:

- |                                  |                            |
|----------------------------------|----------------------------|
| 1. citronella jawa oil           | 2. hydrogen gas            |
| 3. nickel catalyst               | 4. n-butyric acid          |
| 5. isovaleric acid               | 6. hydrochloric acid       |
| 7. mentha arvensis oil           | 8. clove leaf oil          |
| 9. mentha citrata oil            | 10. dimethyl aniline       |
| 11. acetyl chloride              | 12. ion exchange resins    |
| 13. caproic acid                 | 14. heptanoic acid         |
| 15. pelargonic acid              | 16. cinnamic acid          |
| 17. allyl alcohol                | 18. guaicol                |
| 19. dimethyl sulphate            | 20. phosphorus oxychloride |
| 21. monochloro acetic acid       | 22. sodium metal           |
| 23. diethyl sulphate             | 24. octyl aldehyde         |
| 25. isobutyric acid              | 26. longifolene            |
| 27. litsea cubeba/lemongrass oil |                            |

## ANNEXURE 9

### EQUIPMENT REQUIRED TO SET UP THE PRODUCTION FACILITY FOR AROMA CHEMICALS

This equipment is in addition to the equipment already existing at TBAM

1. fractionation columns
2. vacuum pumps ... high vacuum+water ring type
3. reaction vessels
4. washing vessels
5. centrifuges
6. storage tanks
7. filtration equipment
8. distillation columns
9. cooling tower
10. dryers
11. water circulation system
12. steam boiler
13. thermic fluid heater
14. chilling plant
15. stand by electricity generators
16. analytical and quality control equipment.

**ANNEXURE 10**

**ORGANOLEPTIC EVALUATION OF TURKISH PRODUCED ESSENTIAL OILS  
-ROSE OILS-BOTH FACTORY AND VILLAGE TYPE  
-ZIZIPHORA OILS  
AND THE ESTABLISHMENT OF CORRELATION BETWEEN THEIR ODOURS  
AND CERTAIN COMPONENTS AND THE VARIATION THEREIN**

**Rose oils:** It was established that the critical differences between the Turkish and the Bulgarian oils was due to the different percentages of certain components naturally occurring in both oils.

A short resume of the work done is given below:

COMPONENT	BULGARIAN	TURKISH
1. Linalol	% is high; increases volume, sweetness enhances floral character	% is relatively low; top note weakened terpenic character enhanced
2. Cinonellyl formate Citronellyl acetate	% is high; increases floralcy freshness and sweetness in the top note	% is relatively low; these characters are correspondingly reduced
3. $\alpha$ -terpineol	% is high; floralcy of body note is increased	% is relatively low; floralcy of body note is reduced
4. Geranyl acetate	% is low	% is high; adds to the terpenic citrusy aspect
5. Citronellol/Geraniol	% is balanced and high; leading to sweetness as well as strength in the body note	% in village oils is high; sweetness, body note and strength are enhanced % in factory oils is unbalanced; citronellol is much more than geraniol leading to lower body strength
6. Farnesol	% is high; floralcy, sweetness, rosaceous character is enhanced	% is low; these characters are correspondingly reduced

Pinpointing of these olfactory parameters will lead to better quality control at an industrial level.

**Ziziphora oils:** Five samples were evaluated and their odours defined and direct correlation was established between the components of the individual oils and their odour characteristics.

The proper organoleptic evaluation of these oils will now lead to their commercial exploitation.

## ANNEXURE 11

### DETAILS OF THE RECOMMENDATIONS MADE BY THE EXPERT FOR STRENGTHENING TBAM'S FACILITIES TO GIVE BETTER SERVICE TO THE FRAGRANCE AND FLAVOUR INDUSTRIES IN TURKEY

For details of TBAM's existing activities and achievements, please see annexure 6.

The recommendations made by the expert have been made on the basis of its present status, activities and future potential.

In order to be able to achieve its full potential and contribute its maximum services to the Fragrance and Flavour Industries in Turkey, the following recommendations have to be implemented:

1. Establishment of new essential oil bearing crops such as *Mentha citrata*, *Mentha arvensis*, *Eucalyptus citriodora*, lavender, lavençin and *Mentha piperita*.

The cultivation of essential oil bearing plants for the purpose of utilising them as a basis of a modern essential oils industry, requires research experience in a wide spectrum of scientific and technological disciplines. These could be broadly enumerated as follows:

- a) Scientific: Agronomy, taxonomy, genetics, plant pathology, entomology, phytochemistry, soil sciences, plant physiology, analytical chemistry and sensory evaluation.
- b) Plant design, process engineering, and metallurgy.

The cultivation of essential oil bearing plants requires experience in the fields of agronomy and cultural practices peculiar to each crop, pest control mechanisms, fertiliser requirements, crop diseases and the selection of strains that would yield oils, olfactorily acceptable to a perfumer/flavourist.

The steps required to be taken to optimise output in this area are as follows:

- a) Procurement of good planting material
- b) Propagation of new planting material
- c) Transfer of cultivation technology to the farmers
- d) Standardisation of steam/hydro distillation units both in terms of mechanical design and methodology of operation
- e) Standardisation of the oils produced

2. Establishment of properly equipped facility for the production of Aroma Chemicals

Feasibility to manufacture around a 100 aroma chemicals has been established. However the chemical know how and process technology including the ability to evaluate each fraction of distillation, has to be acquired.

For details see annexures 5,6,7,8 and 9.

3. Establishment of a fragrance and flavour research and development laboratory specialising in both quality control as well as creative perfumery

The expert has conducted a short course, necessarily introductory in nature, encompassing a small fraction of the perfumery materials currently available in the world market.

This has to be followed by a series of more advanced courses leading to the establishment of a fully fledged fragrance and flavour creation laboratory.

The objective of such fragrance technology courses should be to train the local technicians to gain further experience in product development and creation of value added products.

The topics required to be covered in detail are as under:

1. Odours and sense of smell. Odour description and classification
2. Aromatic materials from natural sources
3. Aroma chemicals
4. Derivatives of essential oils and aromatic specialities
5. The historical development of perfumery
6. Extrait perfumes and toilet waters
7. Perfume briefing. Perfume creation and compounding
8. Application of perfumes
9. Quality control and quality assurance
10. The perfume industry

For details of equipment required, see annexure 3.

4. Establishment of a properly equipped facility for the production of fragrances and flavours.

Currently the major requirements of the Turkish industry are met by multi-national companies.

The Turkish entrepreneurs in this industry have to be encouraged and provided with the necessary technical inputs to enable them to establish modern manufacturing facilities and follow the trends in modern creative perfumery. Vertical integration, by way of fragrance manufacturers establishing captive aroma chemicals and other raw materials manufacturing facilities, has to be encouraged, to enable them to be more independent and have access to, sometimes, vital by-products.

**Equipment required for the establishment of a fragrance production facility**

- a) Containers for raw materials storage
- b) Containers for finished goods storage
- c) Mixing vessels with heating and stirring arrangement
- d) Blending vessels with heating and stirring arrangement
- e) Beakers, jugs, tubs and trays
- f) Weighing balances
- g) Packaging and labelling equipment

**5. Establishment of applications laboratories for cosmetics soaps and related products**

As per the existing world wide practice, the Turkish fragrance and flavour industries have to back their customers by providing to them, free of cost, the latest applications technology to help new customers to enter the market and thus expand the same.

Thus applications laboratories are required to be set up where practical and industrially feasible procedures for the manufacture of products such as soaps, cosmetics, detergents, cleaners, aerosols and toilet preparations will be demonstrated to Turkish entrepreneurs thus enabling them to manufacture the latest consumer products.

**6. Establishment of courses for Turkish entrepreneurs to absorb, assimilate and use the essential oils, aroma chemicals, fragrances and applications technologies.**

These should be held on a regular basis after the necessary infra-structure has been established, to enable smooth transfer of technology from TBAM to the industry.

**7. Development of a complimentary course to acquaint the Turkish entrepreneurs with the latest international trends and trading and marketing practices.**

Again after the creation of the necessary infra-structure, such courses should be conducted to regularly provide up to date commercial information to help the industry retain its competitive edge.

Related benefits likely to accrue to Turkey due to the establishment of the aforementioned facilities:

- i) Establishment of new pioneering industries directly leading to the introduction of new technologies
- ii) Generation of new employment opportunities in both industrial as well as the agricultural sectors
- iii) Production of Import Substitution items
- iv) Expansion of the industrial base of the country leading to greater domestic consumption of locally produced raw materials in addition to exports





**T. C. ANADOLU ÜNİVERSİTESİ TIBBİ BİTKİLER ARAŞTIRMA MERKEZİ  
ANADOLU UNIVERSITY MEDICINAL PLANTS RESEARCH CENTRE**

**A SHORT COURSE IN PERFUMERY**

**Eskişehir, 21-24 January 1991**

**Outline of the Topics to be Covered:**

- Fragrance blending and compounding
- Sensory evaluation of fragrances
- Raw materials in fragrance industry
- Application of fragrances in cosmetic and toilet preparations
- Nature of the international fragrance industry
  - Commercial aspects
  - Trading practices
  - Marketing techniques
- Quality control
- Importance of R&D

**Note:**

1. The course shall take place at Anadolu University Medicinal Plants Research Centre (TBAM).
2. The course shall be conducted by Mr.Sudhir Jain, UNIDO expert in Perfumery.
3. Participants shall be accomodated at Anadolu Hotel in the University campus. The hotel is just walking distance away from TBAM.
4. Course fee is 800.000TL which includes KDV, accommodation and meals. Invoice shall be issued.
5. Participants are expected to arrive at Anadolu Hotel on the main campus in Tepebaşı on the evening of 20th January Sunday and leave on 25th January Friday.
6. Course fee can either be prepaid to the account of A.Ü.Güçlendirme Vakfı No.888 in Vakıflar Bankası Eskişehir Şubesi, Eskişehir ( a bank draft should be sent to the organizer) or paid during the course.

**Organizer of the Course**

**Prof.Dr.K.Hüsnü Can Başer**

**Tel:(22)152952 Fax: (22) 153616 Tlx: 35147 esak tr**

**Anadolu Üniversitesi TBA Merkezi Yunus Emre Kampüsü  
23470 Eskişehir/TURKEY**

**Tel : (22) 150580 (10 lines) Ext. 3061 (4 lines) Telefax : (22) 153616**

**Telex : 35147 esak tr**

### ANNEXURE 13

#### DETAILS OF TRAINING COURSE IN PERFUMERY FOR TURKISH INDUSTRIALISTS FROM THE FRAGRANCE FLAVOURS COSMETICS AND TOILETTERIES SECTOR

The training course was attended by the following representatives of the Turkish industry:

Sabahattin TUNCER

Deniz KURTCEBE

İlke SONER

Mine CONTEPE

Asiye KOÇGAR

Sibel ÖZKAYA

Eyüp Sabri Tuncer / ANKARA

Kurtsan / İSTANBUL

Teztaş / İSTANBUL

Somek / İSTANBUL

Takimsan / İSTANBUL

Bush Boake Allen / İSTANBUL

The details of the topics covered are as follows:

1. Fragrance blending and compounding:

The modern classifications of fragrances and methodology of compounding and blending and the principles involved therein were explained in detail.

2. Sensory evaluation of fragrances:

The importance of precise and correct sensory evaluation in industry was discussed in detail. The importance thereof in industry from the technical as well as the commercial points of view was explained.

3. Raw materials in fragrance industry:

The variety of raw materials used in the fragrance industry was discussed and diversity of sources from which these raw materials originate was discussed and explained. The technical classification of raw materials was also explained and discussed.

4. Applications of fragrances in cosmetics and toilet preparations:

The variety of products in which fragrances are used was explained.

The methodology of selection of a fragrance for any particular application and the technical and commercial considerations involved were explained.

5. Nature of international fragrance industry:

- commercial aspects
- trading practices
- marketing techniques

were discussed in detail and the Turkish industrialists were made aware of the complex nature of international trade in the fragrance industry.

Concepts of standardisation as well as custom production were explained.

The goods and services available in the international market of the fragrance industry were explained in detail.

#### 6. Quality Control

Olfactory assessment and instrumental quality control methods and their technical and commercial importance were explained.

#### 7. Importance of Research and Development

The importance of building up in house facilities was explained as well as benefits accruing therefrom.

ANNEX XIV.

UNIDO comments on the report

Mr. S. Jain's mission fulfilled a necessary stage of the process of developing the capability of the host institution to enable it to be able to develop technology for utilising the constituents of essential oils, to produce downstream products. In particular the expert was to initiate work in the area of fragrance formulation and set up a sensory evaluation laboratory. Facilities at the TBAM already exist for fractional distillation of essential oils in order to separate their aroma giving constituents. Facilities also exist for complete modern instrumental analysis and quality assessment.

In order to train the Turkish aroma chemists the expert had taken samples of aroma chemicals and formulated fragrances which are key elements in the technology transfer in this subject area, which includes components of art as well as science.

The expert has reiterated the necessity of introducing odour evaluation and olfactory methods of quality assessment into the production activities of TBAM. The consultant conducted a training course for personnel who would be the nucleus of the Odour Evaluation Laboratory at TBAM, which the expert believes should with experience be developed into a Creative Fragrance Laboratory, to collaborate with the Essential Oils and Fragrances manufacturing units within Turkey.

The TBAM already possesses a Chemical Reactor with facilities for bench and pilot scale synthesis of aroma chemicals - simple chemical manipulations of the aroma constituents separated by fractional distillation from natural essential oils.

Hence, a base already exists for such development and there is recognition by the government that TBAM could render such services to industry that such a development facility would confer.

The expert has made full use of his brief time period in rendering good service to the project and his comprehensive report reveals very clearly the extent of his endeavours. He has also been highly commended by the national director.