

REPUBLIC OF KENYA



NATIONAL COUNCIL  
FOR  
SCIENCE AND TECHNOLOGY



## **CATHA EDULIS (MIRAA)**

A DETAILED REVIEW FOCUSING  
ON ITS CHEMISTRY,  
HEALTH  
IMPLICATION, ECONOMIC,  
LEGAL, SOCIAL,  
"CULTURAL, RELIGIOUS, MORAL  
ASPECTS AND  
ITS CULTIVATION.

A REPORT OF THE NATIONAL COUNCIL  
FOR SCIENCE AND TECHNOLOGY

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A detailed review focusing on its Chemistry, Health implication. Economic, Legal, Social, Cultural, Religious, Moral aspects and its cultivation.

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## PREFACE

The Kenya Government maintains an unquestionable recognition of the role of Science and Technology and its contribution to the national development. The Science and Technology Act, 1977, which established the National Council for Science and Technology, requires the Council to determine priorities for Scientific and technological activities in Kenya, and to advise the Government on national science policy.

In this regard, the Council is called upon from time to time to respond to science policy issues affecting our country.

This report is the Council's response to many scientific and socio-economic questions raised about catha edulis (Miraa). The report gives scientific, socio-economic background of "Miraa"; and the Council's recommendations about the issues.

The report was prepared by Professor Charles K. Maitai, the Professor of Pharmacy in the University of Nairobi. The preparation and publication of the report was co-ordinated by NCST's Agricultural and Allied Sciences Specialist Committee and Mr Johnson B. Nyangeri, the Chief Science Secretary in charge of Agricultural Sciences at the Council . I thank them all for the work well done.

I am confident that this report will answer many questions in people's minds about Catha edulis.

MR DAVID K. ANDERE

SECRETARY

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

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## SUMMARY

The year 1972 is considered a watershed in the history of miraa in Kenya. In that year a group of prominent African and Somalia businessmen and politicians registered a company under the name East African Miraa Growers. The Company sought and was granted permission by Horticultural Crop Development Authority (HCDA) to be the sole exporters of miraa to Somalia, then the most important export market for the Kenyan Miraa. This was resented by miraa growers and traders in Nyambeni area.

In 1974 several Meru farmers and businessmen formed Nyambeni Miraa Trade Association as a counterweight to East African Miraa Growers. In 1974 a delegation of its members petitioned the late President Mzee Jomo Kenyatta to have the miraa removed from the schedule of crops under HCDA. The President granted the request and simultaneously decreed that Miraa Prohibitive Ordinance (1951) be repealed. Nyambeni Miraa Association was officially registered on March 10, 1975 (Certificate of Registration No. 7098). By a letter dated August 14, 1976 the Permanent Secretary, Ministry of Agriculture removed miraa from export control and regulations by HCDA. The Mogadishu Miraa Market continued to be dominated by a few businessmen.

Somalia continues to be the most important market for Kenyan Miraa. In July 1995, approximately 134,000 kg of miraa was exported to Somalia through Wilson Airport (Table 1). This is about 3 times more than that exported through JKIA to the European market. For all practical purposes the miraa market in Somalia is not open to Kenyan businessmen, except as middlemen. The Somali businessmen even purchase Miraa from farmers thus creating more resentment among the locals.

Around 1976 attempt was made to open up new markets in Europe, via London. Initially about 40kg was dispatched daily, giving an annual total of approximately 14,600kg. In July 1995, miraa exported to Europe through

JKIA was approximately 40,000kg and the projected export for 1995 is approximately 450,000kg. While new markets are opening, others are closing down. The latter development is due to pressure by WHO and International Council on Alcohol and Addiction (ICAA). These organisations have also been putting pressure on Kenya and Ethiopia to discourage and eventually ban cultivation of miraa. Given the economic importance of miraa to the two countries it must be an uphill task for the two organisations. Miraa exported to Somalia and Europe is of the Leboi type with a very high moisture content. This ensures that the material can last for 4 - 5 days before drying, unlike the Kangeeta and giza types sold locally and which dry within 2 days. Both Kangeeta and giza are much more potent and expensive than the Leboi type, and are harvested from very old trees (over 30 years).

Nyambeni Miraa Trade Association has been exploring new markets for miraa. On June 10, 1977 they wrote to FDA (America) regarding the possible export of Kenyan miraa to America. The FDA wrote back on September 23, 1977 and informed the Association that Miraa would be regarded as a "new drug" as defined in Section 201 (p) of the Federal Food, Drug and Cosmetic Act. They were requested to file an application for consideration giving the necessary scientific data to justify their claims. This effectively brought the matter to an abrupt end since pharmacological information available then was totally inadequate.

Miraa trade is lucrative but the real beneficiaries are the agents who lease farms (sometimes for 5 years) and the wholesalers. Agents harvest and pack miraa and then transport it to urban centres for local consumption or export. Alternatively, wholesales buy packed miraa from agents in specified collection centres (biggest is Muringane) and transport it to Urban Centres. Transportation of miraa is highly specialised. A small miscalculation in timing may lead to missing a connecting flight. The material is perishable and such

a miscalculation may mean losing hundreds of thousands of shillings. Because of logistical problems in transport and the risk involved, miraa trade is dominated by rich businessmen. This creates a lot of resentment among farmers who see businessmen as opportunists thriving on other people's sweat.

Despite the economic importance of miraa as a Cash Crop which provides employment to many people (farmers, businessmen, transporters) in Meru, the authors of Meru District Development Plan do not consider it important even to merit mention. Similarly the HCDA which has given notice of intention to levy duty on miraa export does not include it on the list of scheduled crops. According to the Managing Director, HCDA, miraa is covered in the list under "Cuttings." This paradoxical situation is understandable in view of the unfavourable stand adopted by WHO.

Between 1972 and 1981, United Nations Narcotic Laboratory carried out exhaustive chemicals investigation of Miraa culminating to discovery of new chemicals. The most important of these chemicals was Cathinone which has been referred to as "Natural amphetamine". Details of the chemical work are given in the relevant section of this document (P.8-16).

Between 1979 and 1982, WHO, through several collaborating laboratories carried out pharmacological investigation of Cathinone. The pharmacology of Cathine (d-norpseudoephedrine) active constituent of miraa was reviewed. The pharmacology of Cathinone and Cathine was compared with that of d-amphetamine the prototype of indirectly acting sympathomimetic phenylalkylamines. Details of comparative pharmacological investigation of Cathinone, Cathine and d-amphetamine are given in the relevant section of this document (P. 17).

The culmination of chemical and pharmacological investigations referred to above was that Cathinone and Cathine were included in the list of Psychotropic substances Under International Control (Convention on Psychotropic Substances, 1971) on February, 11, 1986 and became fully effective on August 27, 1986. Miraa as sold in the market is not controlled under this Convention. Recent developments on the international scene must be considered ominous. Action taken by USA, Denmark, Norway and Italy may have a domino effect on others. As of now several airlines have placed total embargo on airlift of miraa cargo. Even neighbouring countries (Tanzania, Zambia) have banned importation of miraa but enforcement is difficult. Kenya enacted the Narcotic Drugs and psychotropic Substances Act (1994) in which Cathinone and Cathine are included in the list of psychotropic substances. Miraa is not controlled under this Act or any other legislation since the Miraa Prohibitive Ordinance was repealed in 1974. More details regarding control of miraa in other countries are given under the relevant section of this document (P.32-33).

Because of the uncertainty and ambiguity surrounding the legality of miraa, technical information on its cultivation is lacking. Naturally research on miraa cultivation should be carried out in Kenya, Ethiopia or Yemen where it is grown on a large scale. In the past, the Ministry of Agriculture in Kenya has challenged local Universities and research institutes to carry out research on miraa (Personal communication with Ministry of Agriculture). Regardless of concern being expressed by WHO and some countries, miraa cultivation in Kenya is bound to continue because of its economic importance in certain communities (Meru, Somali). The documented side effects associated with miraa chewing are relatively minor compared with those associated with tobacco and beer. A distinction must be made between miraa chewing and ingestion of psychotropic substances Cathinone and Cathine. The latter substances can be synthesized in the laboratory. Indeed Cathine has been

available in some countries (West Africa, Germany etc) as an anorexigenic agent, for many years. Research on miraa should be initiated. Curiosity alone is adequate justification for carrying out research on miraa since such work require minimum funding. Documentation of information on the cultivation and harvesting of miraa is included in the relevant section of this document (P.45).

Religious and Cultural aspects of Miraa chewing are considered in the relevant section of this document. Religious interpretation of miraa chewing has been highly subjective. In October, 1983, the author was elected a rapporteur for WHO Intercountry Meeting on the Health, Social and Economic Aspects of Khat (Miraa), held in Mogadishu, Somalia. The author had to rely on an Arab interpreter when delegates from Arab countries gave their presentation. During the presentation by Yemen Republic delegate an argument ensued between the presenter and the delegates from Democratic Yemen. The Arab interpreter gave up midway because according to him the argument (religious) did not make sense. The two countries had not merged and were at loggerheads.

Several Islamic scholars have quoted Quran to discredit miraa by presupposing that it falls within the category of "intoxicants" or "bad and impure things." Such interpretation is highly subjective and this partly accounts for lack of consensus on the subject. Some miraa chewers testify that rather than clouding the mind, miraa chewing leads to clarity of mind. At the international level, arguments for and against continued use of miraa has focused on the health and economic aspects pushing cultural and religious considerations into the background. Perhaps there is need to strike a balance. In the final analysis each country must decide on what course of action to take.

A lot of research on miraa has been accomplished since 1972. However certain aspects require further investigations. The association between miraa chewing and psychosis should be probed further through epidemiological studies. Similarly the possible contribution of miraa to male impotence need to be investigated. Certain chemicals (Catheduline alkaloids, Merucathinone Merucathine) detected in miraa should be isolated in adequate amounts to facilitate pharmacological investigations.

## **7**

From cradle to the grave, human beings spend much of their time and energy in pursuit of happiness and in moments of crisis look up to the Creator for inspiration, through prayers. In pursuance of these goals, plants with psychostimulant effects have been used extensively.

South American Indians used Mexican Peyote cactus and Psilocybe mexicana mushrooms to evoke divinatory revelations during cultural-religious rituals. Later two hallucinogens, mescaline and psilocybin were isolated from the cactus and mushroom respectively. The same Indians used Coca leaves (now source of cocaine) to produce a feeling of detachment and inurement to discomfort.

In the orient, the Chinese used poppy plant (*Papaver somniferum*) to "chase the dragon" in cultural ceremonies. They also used *Cannabis sativa* (hashish, Marijuana, bhang) in cultural ceremonies and as medicine as far as back as 2700 BC. Today, the poppy plant and cannabis have yielded morphine and tetrahydrocannabinols respectively.

Other plants which have been used by indigenous people to induce mild psychostimulant effects include Iboga, Nutmeg myristic (*Kunzea mangia*), Cola nut and *Catha edulis* (Miraa).

The use of the above plants in cultural-religious ceremonies was under strict control. Today, this is no longer the case. Many of them have been stigmatised and have acquired the label, "drug of abuse". Their use constitute a threat to organised society. In this document, we shall focus on *Catha edulis* (Miraa) cultivated and used extensively in Kenya and which has been the subject of much discussion recently.

## CHEMISTRY OF MIRAA (*Catha edulis*)

The following is a chronological sequence of chemical work on miraa covering the period 1887 - 1983. No new findings have been published since 1983.

1. Fluckiger and Gerock (1887) analysed leaves of miraa for caffeine. No caffeine was detected but an alkaloid of undetermined structure was isolated and given the name Katin.
2. Mosso (1891) isolated an alkaloid which he called Celastrine. The Structure is not yet determined.
3. Beitter (1901) crystallised an alkaloid which he found identical to katin and celastrine.
4. Stockman (1912) Isolated 3 alkaloids Cathine, Cathinone and cathidine but did not characterise them. His Work questioned by others.
5. Wolfes (1930) isolated an alkaloid and characterised it as D-norpseudoephedrine (DNE; subsequently central nervous stimulating effect of Miraa is attributed to DNE. (Fig. 1)
6. Brucke (1941) raised the possibility that DNE alone could not account for observed effect of miraa. He based his argument on pharmacological work using miraa.

7. Hoffman (1955), Winterfield (1960), Alles (1961) supported the view that DNE could account for observed effect of miraa. They based their arguments on animal and human experiments. Behaviour changes are difficult to quantify and argument continued .
8. Paris and Moyse (1958) detected 3 to 6 alkaloids depending on method of extraction. They suggested that one of the alkaloid was ephedrine. The finding has never been confirmed.
9. Friabel and Brilla (1963) used a combination of chemical and pharmacological methods to study miraa. Unlike many of the previous researchers they used fresh miraa material. They concluded that fresh miraa contain chemical(s) that was more potent than DNE but which was transformed to DNE during drying.
10. Karawya and others (1968) isolated 3 alkaloids in addition to Cathinine. Cathidine. and Eduline. No chemical structures were proposed.
11. Ruicker G. (1 973) using GLC/MS reported the presence of 7 nitrogen containing substances. Only cathine was characterised while others were not.
12. From 1 972 onwards United Nations Narcotic Laboratory embarked on comprehensive chemical investigation of Miraa.
  - 12.1 Several prominent chemists were recruited and vast financial resources were allocated.

- 12.2 Department of Pharmacy, University of Nairobi collaborated. Extraction of fresh miraa material was done in the Department.
- 12.3 Chemical investigation culminated with isolation and characterisation of a new compound, (-)  $\alpha$ -aminopropiophenone given the name Cathinone (UN doc MNAR/11/75). (see Fig. 1).
- 13 Spatial configuration of cathinone was then elucidated by x-ray crystallography and E-stereoregulation (UN doc MNAR 7/1978) and the molecule was reproduced by synthesis.
14. Subsequent work showed cathinone is present in young leaves of miraa thus explaining the preference for this material by miraa chewers. Schorno and Brenneisen (1978) showed that cathinone accounts for 70% of the phenylalkylamine alkaloids in miraa. There is transformation of cathinone to DNE in adult leaves.
15. Cathinone is also converted to (-) norephedrine during drying of fresh leaves (see Fig. 1).
16. During extraction procedures cathinone may cyclize to form dimethyldiphenylpyrazine. Other artifacts may be formed. This situation is not clear.
17. Other compounds isolated from miraa of Kenyan origin are Merucathinone and Merucathine. In above compounds, the ethylamine side chain of Cathinone and Cathine (DNE) is attached to

a cinnamoyl group rather than a benzoyl group. These compounds have not been synthesized and their pharmacology not described..

**18. Crombie (Department of Chemistry, University of Nottingham, (U.K.) in collaboration with United Nations Narcotic Laboratory has isolated another group of alkaloids called Cathedulins (Fig. 2). Cathedulins have molecular weights of 600 to 1200. The accepted view is that cathedulins do not contribute to CNS stimulating effects associated with miraa (euphoria etc). Cathedulins have not been synthesized and adequate material for pharmacological research is not available.**

**19. Other chemicals found in miraa which do not contribute significantly to its pharmacological effect are as follows:-**

**19.1 Triterpenoid quinones (Fig 3.): Celastrol,**

**pristimerine, iguesterin and tingenone. These are neutral compounds.**

**19.2 Essential oils (Fig) ocimene, nerol,  $\beta$ -phellandrene,**

**terpinolene, linalool,  $\alpha$ -terpineol,  $\alpha$ -and  $\beta$ -pinene  $\alpha$ - and  $\beta$ -thujone and fenchone.**

**19.3 Flavonoids - Kemferol, Quercetin, Myricetin (Fig. 5).**

**19.4 Tannin - phenolic compounds, causing gastritis and duodenitis**

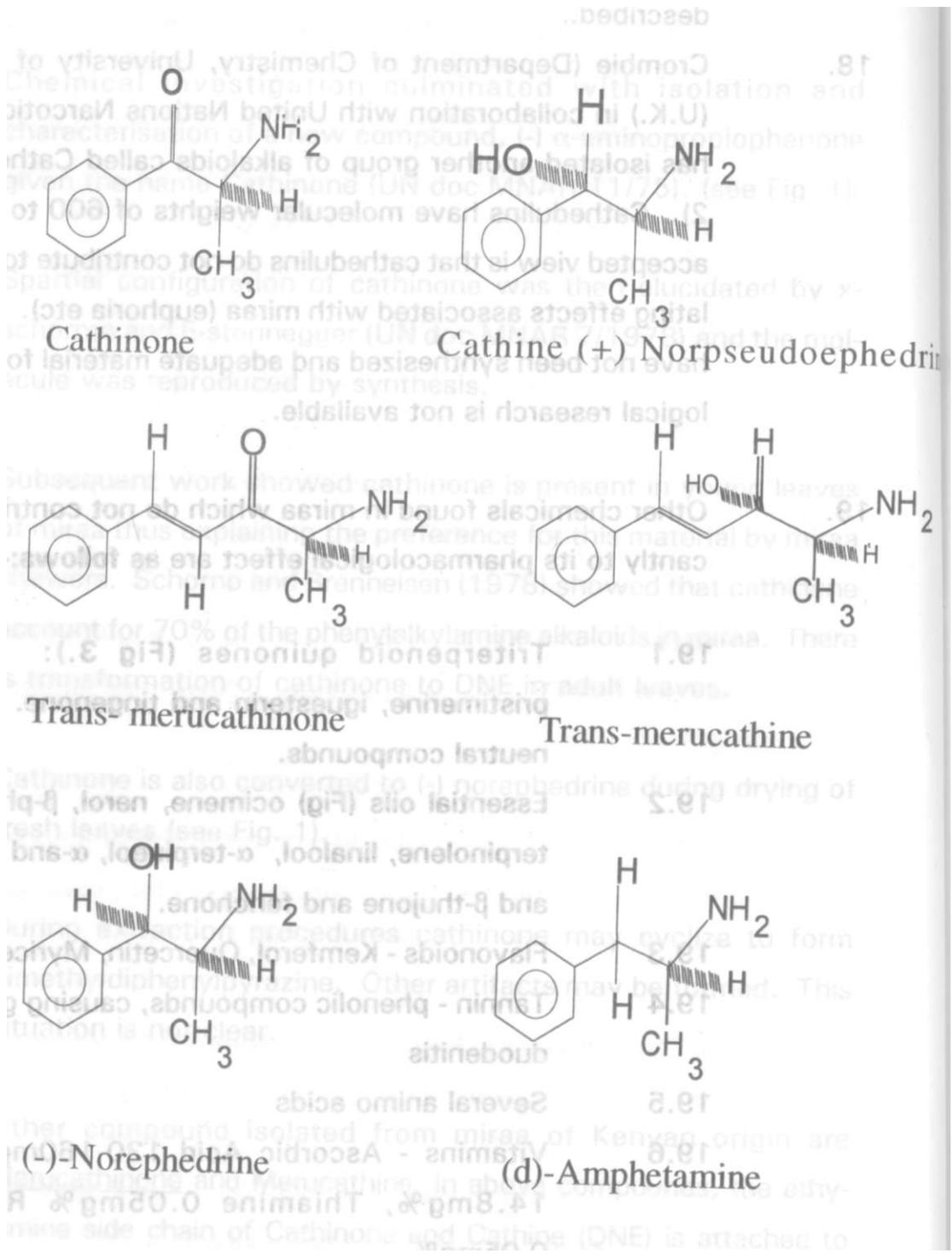
**19.5 Several amino acids**

**19.6 Vitamins - Ascorbic Acid 130-160mg%, Niacin**

**14.8mg%, Thiamine 0.05mg% Riboflavine  
0.05mg%**

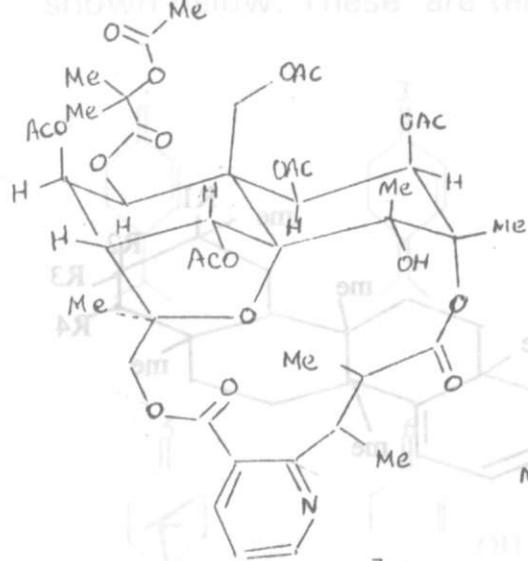
**19.7 Sugar alcohols**

FIG1 CHEMICAL STRUCTURE OF CATHINONE  
CATHINE AND RELATED COMPOUNDS

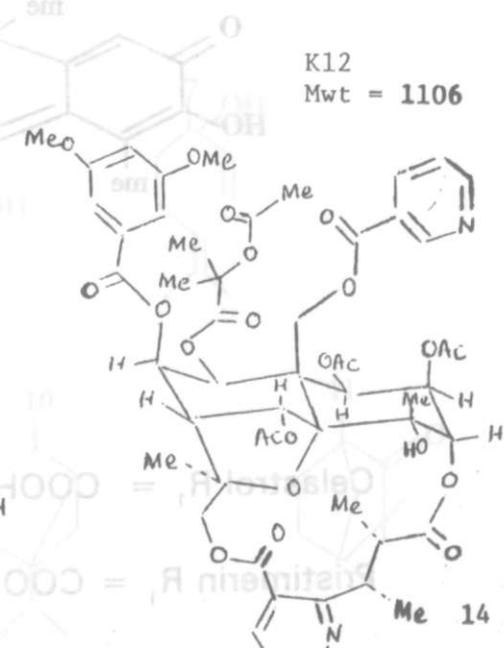


FIVE CATHEDULIN ALKALOIDS ISOLATED FROM  
FRESH CATHAEDULIS MATERIAL FROM KENYA

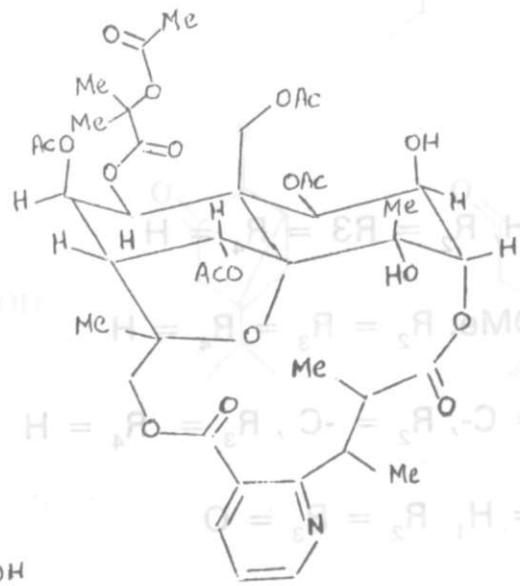
KI  
Mwt = 891



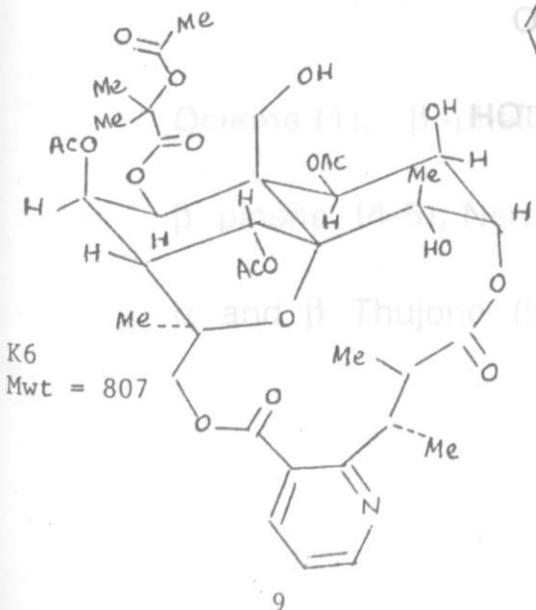
K12  
Mwt = 1106



K2  
Mwt = 849



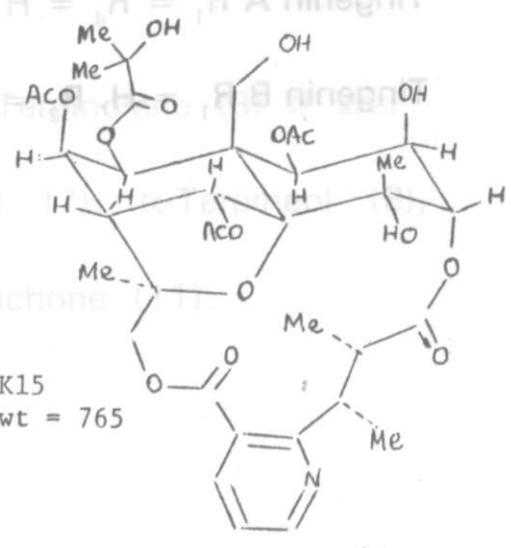
8



K6  
Mwt = 807

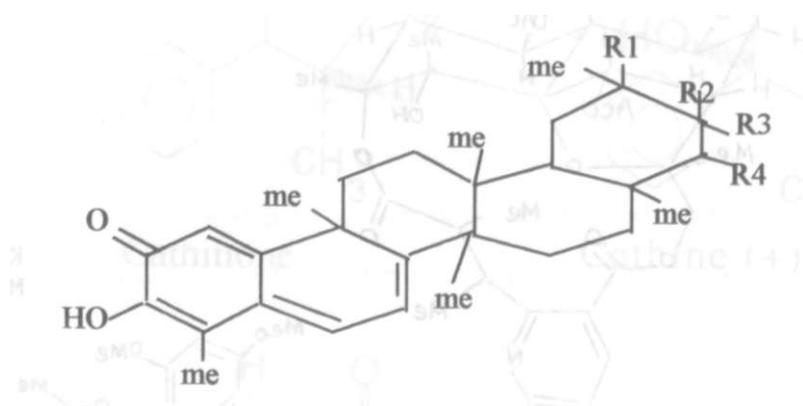
9

K15  
Mwt = 765



10

FIG 3 TRITERPENOID COMPONENTS OF  
CATHA EDULIS (MIRAA)



Celastrol  $R_1 = \text{COOH}$ ,  $R_2 = R_3 = R_4 = \text{H}$

Pristimerin  $R_1 = \text{COOMe}$ ,  $R_2 = R_3 = R_4 = \text{H}$

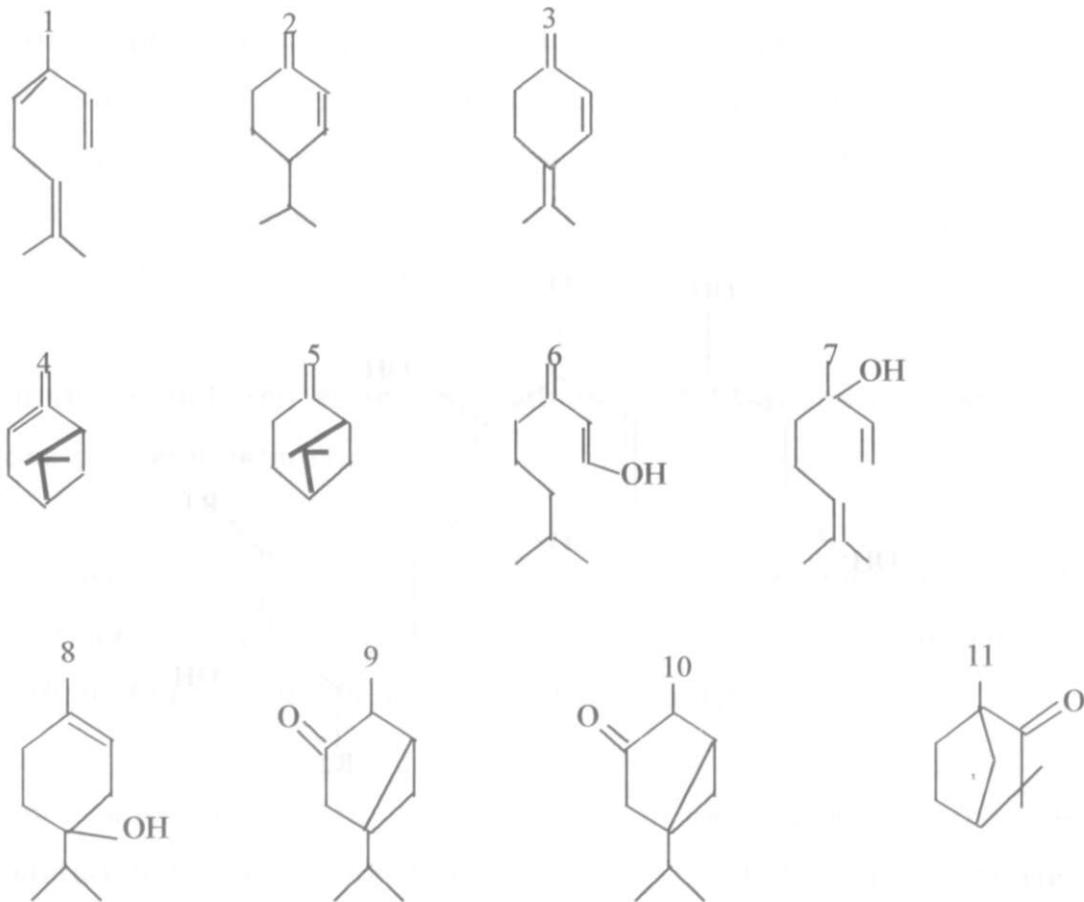
Igusterin  $R_1 = -\text{C} = \text{C}-$ ,  $R_2 = -\text{C}$ ,  $R_3 = R_4 = \text{H}$

Tingenin A  $R_1 = R_4 = \text{H}$ ,  $R_2 = R_3 = \text{O}$

Tingenin B  $R_1 = \text{H}$ ,  $R_2 = R_3 = \text{O}$ ,  $R_4 = \text{OH}$

FIG. 4 VOLATILE COMPOUNDS (ETHEREAL OIL COMPONENTS)

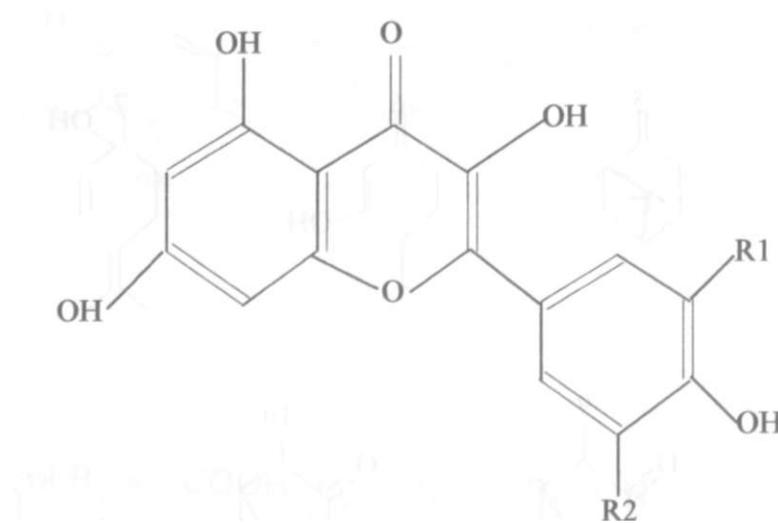
Gas Chromatography analyses indicated presence of compounds shown below. These are terpenoids



Ocieme (1),  $\beta$ -phellandrene (2), Terpinolene (3),  $\alpha$  and  $\beta$ -pinene (4-5), Nerol (6), linalool (7),  $\alpha$ -Terpineol (8),  $\alpha$  and  $\beta$  Thujone (9 and 10) Fenchone (11).

FIG. 5 FLAVONOIDS

Tannins is a term which describe a complex group of phenolic compounds and also flavonoids such as ones shown below



Kempferol  $R_1 = H$   $R_2 = H$

Quercetin  $R_1 = R_2 = H$

Myricetine  $R_1 = R_2 = OH$

## MIRAA CHEWING - IMPLICATION TO HEALTH

1. Consideration of health aspects arising from chewing miraa must focus on pharmacology and toxicology of all chemical constituents present in miraa. Pharmacological studies of Cathinone and Cathine at cellular, organ and system level dominate published literature. Other chemicals present in miraa (Cathedulins, tannins, amino acids, vitamins etc) are considered relatively unimportant.
2. **Somatic (peripheral) effects of Cathinone and Cathine compared to those of d-amphetamine**

Extensive studies in humans and experimental animals show that Cathinone, Cathine and d-amphetamine have comparable pharmacological profiles and only differ in potency.

They cause increased blood pressure, increased heart rate (palpitations), increased force of heart contraction, mydriasis (dilatation of pupil), increased metabolic rate and oxygen consumption, hyperthermia (raised body temperature) and mild analgesia.

The actual mechanism of action is explained and in nearly all cases it is through release of norepinephrine or blocking its uptake.

Cathinone is metabolised to Cathine in humans and both are rapidly excreted in urine. This explains the short lived effect of miraa.,

### 3. Behaviourial changes associated with chewing miraa

Cathinone, Cathine and d-amphetamine increase psychomotor activity. All have rapid onset of effects and short duration. In humans the psychostimulant effect is manifested as elevated mood, alertness, agitation (tendency to talk too much) euphoria, and apprehension.

Neurochemical investigation show that the **3** drugs release brain catecholamines (norepinephrine and dopamine). Cathinone increased dopamine turnover by **32%** in experimental animals. For Cathine and amphetamine the increase was less. The **3** drugs impair dopamine uptake prolonging its effect on receptors.

Cathinone, Cathine and d-amphetamine induce stereotype behaviour (characteristic head movements in rats, sniffing etc). The drugs also modify operant behaviour. Animals trained to operate levers to get food had their behaviour disrupted. These findings in animals may explain disorientation and altered perception observed in miraa chewers. Self-administration studies in animals demonstrate that the **3** drugs enhance animals behaviour that give them access to the drugs. This emphasizes the dependence potential of the **3** drugs. High re-enforcing efficacy of cathinone show that it has a very high dependence potential hence its inclusion in Schedule I in the list of Psychotropic drugs under International Control (see under Legal Consideration). Amphetamine and cathine are in schedule II and III respectively. Cathinone, Cathine and amphetamine are anorexigenic agents. This explains the use of miraa to suppress a feeling of hunger.

4. Acute toxicological effects of Cathinone, Cathine and amphetamine are extension of their pharmacological effects. These would be observed with high doses of 3 drugs. In the case of miraa chewer, it is difficult to achieve high blood concentration of Cathinone and Cathine. A miraa chewer will chew a wad of plant material for about 10 minutes before spitting it out. Under such circumstances a dynamic equilibrium is achieved in which the amount of drug absorbed is offset by that excreted in urine. Consequently a miraa chewer will experience fatigue and depression as soon as he stops chewing miraa since the blood level of cathinone and Cathine will fall rapidly (Maitai C. K. et\_al J. Pharm. Sci. Vol. 64, 702-703. 1975).

Some of the effects expected with high doses of Cathinone and Cathine are: palpitation, restlessness, hallucinations, dry mouth, constipation (due to decreased GIT motility), urine retention and mydriasis.

Effect on libido is probably biphasic. In the first phase, sexual prowess may increase but information given by miraa chewers indicate that the practical performance (erection and ejaculation) is poor. In the compensatory phase (several hours after stopping chewing of miraa), the person experience fatigue, and decreased libido. The individual is withdrawn and suffers form insomnia.

5. **Chronic toxicity (Long term effects)**

Long term effects of chewing miraa is not well documented. Earlier reports portrayed miraa chewers as being aggressive and "antagonistic to all forms of authority." Miraa has been implicated as a **cause** of insanity. These reports are highly subjective and not

supported by epidemiological studies. (Carothers, E. Afr. Med. J. Vol 22, 4-5, 1945 and Dhadphale et al E. Afri. Med J 58 130 1981).

Miraa chewers complain of stomach upsets and constipation. Animal experiments show that miraa caused gastritis and duodenitis, an effect attributed to high content of tannin. (Maitai C. K. Toxicol, Vol 15, 363 - 366, 1977). There is also damage to buccal mucosa and discolouration of teeth.

Some researchers have commented on the nutritional value of miraa, because it contains vitamins (vitamin C, Niacin, thiamine, riboflavine) aminoacids, mirals etc. These are relatively unimportant.

Miraa has been implicated in male impotence. Both Cathinone and Cathine have effects similar to d-amphetamine. The latter has been associated with importance among drug addicts. No epidemiological studies have been done to confirm or repudiate possible contribution of miraa in impotence.

## **MIRAA CHEWING - ECONOMIC CONSIDERATION**

1. For purpose of considering economic aspects of Miraa, countries can be grouped into four categories.
  - a. Those that grow miraa for domestic use only e.g. Madagascar.
  - b. Those that grow miraa but import to supplement limited domestic supply e.g. Yemen.
  - c. Those that grow miraa for domestic use and for export e.g. Kenya, Ethiopia.
  - d. Those that import all their requirements from other countries e.g. Somalia, Djibouti.

Those in category (c) and (d) merit further consideration.

2. Those that import all their requirements from other countries

In 1982 Somalia spent approximately US\$ 57,000,000 to import miraa, mostly from Kenya. Data presented here show that currently Somalia is importing about 1,200,000kg miraa annually from Kenya. This cost the country approximately K.shs. 120,000,000 equivalent to US\$ 24,000,000. In 1982 Djibouti imported from Ethiopia approximately 3,000,000kg of miraa valued at Djibouti Franc 2,100,000,000, equivalent to US\$ 3,000,000. Above information was given during a WHO Intercountry meeting on the Health, Social and Economic Aspects of Khat (miraa) held in Mogadishu, 24 - 28, October, 1983.

The economic implications for both countries are obvious and need no elaboration.

### 3. **Those that Export Miraa - The Kenyan Example**

Miraa provides employment to a lot of people. These include farmers, harvesters, packers, loaders, wholesale and retail traders, and transporters. The number is probably more than 100,000. The County Council of Meru levies cess of miraa which they use in development of the area. It is estimated that 60% of Nyambeni population depend directly or indirectly on miraa for their livelihood.

A survey carried out for the purpose of writing this document generated data on miraa trade. The major markets for Kenyan miraa were identified as follows:

#### Somali Market

The amount of miraa exported to Mogadishu through Wilson Airport in January, April and July was 124,360, 79,300 and 134,180kg respectively. This gives an average of 112,613kg per month. Adopting a working figure on 100,000kg per month gives a total of 1,200,000kg per year. The income generated by exporting miraa to Somalia is approximately K.shs. 120,000,000.

#### European Market

The amount of miraa exported to the European market in January, April and July was 28,669, 38,360 and 39,273 respectively giving an average of 35,434kg per month. This is equivalent to 425,208kg per year. The income generated from above is approximately K.shs. 42,520,800.

### **Internal Market**

Nairobi market receives approximately 5,000kg per day, North Eastern Province (Marsabit, Wajir, Mandera) receives approximately 4,000kg per day.

The rest of the country (Mombasa, Meru etc) receive approximately 3,000kg per day.

The total amount of miraa consumed in Kenyan market is therefore estimated as 12,000kg daily.

Total consumed in a year is estimated as 4,320,000kg.

Total income generated by Kenyan market is estimated at K.shs. 432,000,000.

In the above calculations a working figure of K.shs 100 per kg is adopted. Thus the total income accruing from miraa grown in Kenya is estimated at K.shs. 595,000,000 equivalent to US\$ 12,000,000. Regrettably very little of this money is received by the farmer. Much of it goes to the agents who lease farms, wholesalers, brokers, transporters and retailers.

4. The disproportionate distribution of income accruing from miraa sale as listed above is a potentially explosive issue. Nyambeni Miraa farmers and dealers feel that under the current willing-buyer-willing seller arrangement, outsiders are gaining more than the indigenous people of Nyambeni. Because of the deeply rooted cultural significance of Miraa among the Meru, the traditional council of elders

Njuri-Ncheke is taking interest in this controversy. The much publicised notion that Miraa provides the bridge and highway through which farmers move from grass thatched to corrugated iron roofed house or from tenantry to landlordship applies to only few individuals.

5. Miraa is not listed as a cash crop in the Meru District Development Plan and is not a scheduled crop under the Horticultural Crop Development Authority. The latter claim that miraa is covered in the list under the heading "cuttings."

Starting from Wednesday September 6, 1995 HCDA is charging a levy at the rate of 20 cents for every kg of miraa exported. The move is likely to be contested in court according to the Chairman Nyambeni Miraa Traders Association.

TABLE 1

**MIRAA EXPORT TO MOGADISHU. SOMALIA THROUGH  
WILSON AIRPORT**

DATE	WEIGHT IN K£ AS PER CUSTOM ENTRY	NO. OF ENTRIES	TOTAL WEIGHT IN KG
04/1/95	3000	1	3000
04/1/95	2400	2	4800
05/1/95	2400	2	4800
14/1/95	8400	1	8400
14/1/95	4200	1	4200
15/1/95	2400	1	2400
17/1/95	8960	1	8960
19/1/95	8960	5	44800
23/1/95	2000	11	22000
24/1/95	2000	3	6000
27/1/95	1400	5	7000
29/1/95	1600	5	8000
	<b>TOTAL FOR JANUARY</b>		<b>124360</b>
02/4/95	1600	3	4800
04/4/95	4000	9	36000
04/4/95	1600	8	12800
07/4/95	3000	1	3000
16/4/95	1500	1	1500
19/4/95	3000	2	6000
20/4/95	3000	4	12000
	<b>TOTAL FOR APRIL</b>		<b>79300</b>
04/7/95	1200	7	8400
07/7/95	1200	9	10800
12/7/95	1200	9	10800
12/7/95	1200	11	13200
15/7/95	4500	10	45000
18/7/95	980	1	980
28/7/95	4500	10	45000
	<b>TOTAL FOR JULY</b>		<b>134180</b>

TABLE 2

**MIRAA EXPORTED THROUGH JOMO KENYATTA  
INTERNATIONAL AIRPORT JANUARY 1995 (FIGURES IN KG)**

62	42	547	105	170
17	246	67	100	683
55	43	101	88	56
91	702	82	496	357
45	435	183	695	247
111	98	141	166	38
66	10	73	426	379
707	123	220	206	55
45	301	192	168	173
103	10	45	476	330
46	225	88	75	727
164	83	116	89	87
170	48	758	99	206
25	507	533	15	610
144	845	92	31	23
192	113	485	131	90
117	420	544	289	
175	210	49	204	
531	290	110	62	
406	100	86	124	
95	106	103	558	
60	23	349	256	
165	221	299	129	
165	30	286	45	
96	45	191	675	
45	196	349	40	
200	577	176	92	
32	155	608	753	
91	61	237	228	

**TOTAL = 28,669**

TABLE 3.

**MIRAA EXPORTED THROUGH JKIA IN APRIL 1995**  
**(FIGURE IN KG)**

145	64	168	17	160
705	79	64	794	150
750	120	374	40	392
352	207	118	154	276
208	245	612	130	84
94	411	222	369	291
315	44	487	257	182
300	34	612	305	271
233	32	56	130	130
138	52	185	218	27
257	95	610	241	870
402	233	801	146	27
220	133	19	126	703
287	193	75	196	47
243	67	32	556	45
67	98	95	120	150
177	360	133	356	185
238	215	46	93	899
616	766	342	636	105
230	69	55	25	464
307	17	732	328	161
321	815	742	375	362
90	238	210	50	322
213	115	61	52	83
762	78	206	225	218
168	58	172	185	218
690	19	686	356	313
295	263	731	97	245
157	132	678	334	139

TOTAL = 38,368

## MIRAA CHEWING - LEGAL ASPECTS

The legal aspects of miraa chewing can be discussed under subheading:

1. Legislation at international level
2. Legislation in Kenya
3. Legislation and prohibition measures in other countries.

### 1. LEGISLATION AT INTERNATIONAL LEVEL

- 1 935                      Advisory Committee of the League of Nations on the Traffic of Opium and Other Dangerous Drugs discussed miraa (League of Nations Doc 1617 of February, 3, 1936).
- 1956                      Miraa discussed during a session of United Nations Commission on Narcotic Drugs at the request of the Arab League.
- 1957                      UN Commission on Narcotic Drugs recommended that UN Economic and Social Council invited WHO to study miraa (UN Economic and Social Council Resolution 1 67 (XXXIV) D Doc E/3048 1958).
- 1958                      WHO began to collect relevant information on miraa.
- 1964                      WHO requested Commission on Narcotic Drugs to look into question of miraa.

- 1971 Commission on Narcotic Drugs requested UN Narcotic Laboratory to undertake detailed chemical investigation of miraa.
- 1973 - 1981 UN Narcotic Laboratory with financial assistance, of UN fund for Drug Abuse Control undertook a comprehensive investigation of miraa, culminating with discovery of cathinone, cathedulins etc.
- 1979 - 1983 WHO coordinated pharmacological research on cathinone. Other aspects of miraa were investigated.
- 1980 - 1983 WHO Advisory groups continued to review pharmacology of miraa.
- 1986 Cathnone listed under Scheduled I and Cathine under Scheduled III in the Convention on Psychotropic substances under International Control. Drugs covered by the Convention are listed in Schedules I, II, III, and IV according to "Psychotropic potency". Schedule I drugs (Cathinone, LSD, Psilocybe) are most potent while schedule IV (benzodiazepines etc) are the least potent. Miraa, initially the concern of WHO and UN Commission on Narcotic Drugs, is not covered by the Convention or any Other International Legislation.

**LEGISLATION OF MIRAA IN KENYA**

- 1934 Meru Local Native Council prohibited use of miraa by people other than those traditionally permitted (Meru elders and Somalis).
- 1939 Limited Control measures introduced by British Colonial Government but not enforced.
- 1944 Isiolo Local Native Council prohibited possession of any portion of miraa plant. Somali women in Isiolo petitioned District Commissioner to ban miraa because it was contributing to break up of families.
- 1945 Control measures against miraa were enacted following alarming and subjective reports about miraa as a cause of insanity (Carothers - E. Afr. Med. J. 22 4-6, 1945).
- 1951 Miraa Prohibitive Ordinance (Cap 339, Laws of Kenya) introduced. Prohibition applied to sale, cultivation, use and possession of miraa in the following areas:
- (i) The Northern Province
  - (ii) Areas situated within a radius of 10 miles of the Office of District Commissioner, Isiolo.
  - (iii) That portion of Meru Land Unit lying to the North of Isiolo - Barba-Tulla Road and that portion thereof.
- 1962 Miraa Prohibitive Ordinance revised along other Acts prior to Kenya Independence but not significant changes.

1974                    Miraa Prohibitive Ordinance repealed through a Presidential decree.

1994                    The Narcotic Drugs and Psychotropic substances (Control Act 1994) enacted through Kenya Gazette supplement No. 41, Act No. 41 of 1994 Cathinone and Cathine included in the listed of Psychotropic substances but miraa not included.

All psychotropic substances are lumped together in Schedule II. Schedule I lists Narcotic Drugs (morphine, cocaine etc) while Schedule III lists prohibited plants (poppy plant, coca plant cannabis).

An exporter of miraa must ensure that the receiving country has not banned it. This information is available from Office of the President.

## LEGISLATION OF MIRAA IN OTHER COUNTRIES

Yemen	In 1972 miraa was banned but political agitation forced Government to withdraw the ban. Currently there is no ban on miraa import.
Djibouti	There is no ban on miraa import. Ethiopia exports to Djibouti about 8 metric tons of miraa every day.
Saudi Arabia	There is total ban on miraa import since 1956.
Somalia	Miraa banned in 1986 but soon after that the Government collapsed. Today export of miraa is not banned but the trade is patronised by powerful military men and clan leaders.
Ethiopia	Self-sufficient in Miraa. Export controlled through Export Monopoly Commission.
Denmark, Italy, Norway, Sweden	Miraa import banned.
Canada	Has not enacted law to ban miraa but importation not allowed. Miraa is confiscated and destroyed but importer is not prosecuted.
South Africa	Has no policy on miraa. Import of miraa from Kenya is increasing.

U.S.A.	A small amount imported from Kenya for "Meat seasoning". It is not clear whether this is a label of convenience. It can not be exported to USA as a drug.
Britain	Miraa not banned. London is used as a distribution centre to other European Countries (Free trade within European Economic Community).
Zambia, Tanzania	Miraa banned but enforcement is difficult, particularly when it is transported by road.
Holland	Miraa is not banned.
Germany	Fights at airport over possession of imported miraa, especially by people of Somali Origin led to restriction (partial ban) of direct miraa import.
Several Airlines	Have placed embargo on miraa cargo.
Many Countries	Have Agricultural Laws regarding importation of fresh untreated plant material to minimise possibility of introducing pests, viral and fungal diseases. Miraa could be controlled through such laws.

## MIRAA CHEWING - SOCIAL ASPECTS

Social implications of miraa can be considered at national (societal) and individual levels.

### 1. At National Level

- At national level, social aspects of miraa chewing are closely intertwined with economic aspects.
  
- Countries which import miraa on a large scale (e.g Somalia, Djibouti) spend a lot of foreign exchange on single non-essential item at the expense of other essential items and services (books, medicine, food etc).
  
- Countries which export miraa on a large scale (Kenya, Ethiopia) earn much needed foreign exchange which they use in development projects. Furthermore, miraa cultivation and trade provide employment to a large number of people (farmers, traders, transporters etc)
  
- Depending on which side of the divide line, a country can view miraa as a national tragedy or a blessing.
  
- Kenya is currently exporting approximately 1,200,000kg of miraa to Somalia and approximately 425,000kg to other parts of the world every year. This earns the country approximately K.shs. 163,000,000 per year, equivalent to US dollars 3,000,000.

## 2. At the Individual level

- (a) Many individuals who chew miraa are not rich. For example, watchmen employed in Nairobi are known to chew a bundle of miraa (costs K.shs. 100) almost everyday. Such a person will spend K.shs 200 - 3000 per month on miraa. This is almost his entire monthly salary. The urge to continue chewing miraa is irresistible and a person who does not have money is likely to indulge in criminal or anti-social activities. In the case of a watchman this may mean colluding with criminals, to steal.
- (b) A miraa chewer is likely to neglect other essential needs (e.g. personal hygiene). Miraa chewing also suppresses the appetite leading to poor eating habits, and consequent poor health. A few people feed well before chewing miraa.
- (c) A miraa chewer is likely to neglect his family responsibility. If he joins miraa parties, he will be away from the family for 4 - 5 hours. When he returns from the party, he will be withdrawn and suffering from mental fatigue. Decreased libido and tendency to spend a lot of time away from the wives has been cited as a cause of marital problems.
- (d) Initially, miraa chewing enhance working capacity but this is of no consequence to people who chew miraa in social gatherings. In the second phase (after the party) individuals become irritable, apathetic and suffers from insomnia. Inadequate sleep (twilight sleep) makes concentration difficult the following day. Students are particularly affected.

- (e) Peer pressure and fear of being labelled a non-conformist compel many individuals to join miraa parties. As in the case of beer drinking there is a tendency to chew miraa in the company of others rather than in privacy.
  
- (f) In traditional Meru society and also among the Somalis of Kenya, miraa chewing was a preserve of elderly men who used it to enhance social interaction. Young men and women could only chew it in privacy. Urbanisation and breakdown of extended family system has made miraa chewing a free for all pastime. Many young people, (many of them unemployed), chew miraa and also use other drugs such as mandrax and bhang. The antisocial behaviour arising from use of these other drugs could mistakenly be attributed to miraa. For miraa to qualify as a social drug, it must be used in the right cultural setting and not a pastime for idlers.

## **MIRAA CHEWING - CULTURAL ASPECTS**

1. The cultural aspects of miraa chewing is closely intertwined with social and religious aspects. Discovery of stimulating effect of miraa is attributed to unnamed pastrolist (herder) who noticed that his goats were unduly stimulated after eating miraa leaves. The -herder confirmed his suspicion when he chewed fresh miraa shoots and experienced euphoria and wakefulness.
2. The origin of miraa chewing habit predates the recorded history. The first direct recorded reference to miraa chewing was in 1237 AD. Use of miraa as tea was also recorded about that time. Before then there were many indirect references to miraa eg as "flower of paradise".
3. Miraa has been closely identified with Islam for many centuries. Most of those who chew it are moslems who do not take alcohol. There is no consensus among Islamic scholars on the acceptability or otherwise of miraa chewing in the Quran. This aspect is discussed in greater details in the relevant part of this document.
4. In many moslem countries (Yemen, Djibouti, Somalia) miraa is used in vigil for the dead, at feasts, ceremonies celebrating births, circumcision or marriages. It brings people together and promotes social interactions.
5. Chewing miraa often takes the form of a ritual. In most homes a special room is set aside for this purpose. Usually a large group of people come together for the "miraa party" during which ideas on wide range of topics are exchanged. Miraa chewing enlivens the imagination, leads to clarity of mind and induces euphoria. Reading of Quran and singing praises to Prophet Mohammed is common among

moslems during these sessions. A miraa chewer will often show obsession to a certain topic and continues to discuss it for hours on end.

6. Peer pressure compel many people to chew miraa. In Yemen and Djibouti over 80% of adult male population chew miraa. The population of women who chew miraa in these countries is approximately 10%. In these countries guests often expect their hosts to entertain them with miraa. A similar exist among Kenyan Somalis.
7. Miraa parties continue late into the night. This practice may not have serious implication for the elderly males (over 60 years). However, for those with young children and wives, it may create marital problems. In 1944, Somali women in Isiolo were so incensed that they petitioned the local District Commissioner to ban Miraa.
8. Among the Meru people, miraa chewing is deeply rooted in their culture which predates recorded history. The plant is revered almost to the point of being considered sacred. The emphasis on miraa as a cash crop is a relatively new phenomenon.

A young Meru man is expected to offer a bundle of miraa to prospective father-in-law in way of introduction. Similarly reconciliation process is often preceded by an offer of miraa. Acceptance of miraa by the aggrieved party is a positive signal to continue with reconciliation.

9. Use of miraa in traditional herbal medicine is limited and generally has been overshadowed by its use as a social drug. The Masaai and

Kipsigis use miraa for "general body illness." Bushmen of South Africa use it for "chest diseases".

10. Use of miraa as tea was reported in the 13th Century. In Early literature, European explorers who recorded use of miraa tea in Abyssinia were unable to differentiate it from coffee. Considering that the leaves of miraa contain cathinone and cathine it is surprising that miraa tea (known as Abyssinian tea, Arabian tea etc) has not been popularised.
11. The practice of chewing miraa is often referred to in derogatory terms by those who do not chew miraa. Those who do it are said to chew the plant material, "just like animals". A wad or quid of the material is chewed until all the juice is extracted and this may take up to 10 minutes after which the residue (green paste) is spitted out. This undignified practice, when done in public creates resentment and discourage many people from experimenting with miraa. At best the practice is dismissed as a public nuisance.

## MIRAA CHEWING - RELIGIOUS CONSIDERATION

1. Miraa chewing is really not an issue among Christians. Many view it with disdain and associate it with moslems or indigenous people not identified with any religious. It is therefore reasonable to focus on Islam in the present discussion.
2. Some Muslim traditions emphasize that miraa is holy. It has been referred to as the "flower of paradise". Among the moslems of Harar in Ethiopia, there was a time no private or religious ceremony took place without ritual chewing of miraa accompanied by much chanting and praying. The consequent religious exaltation was regarded as a gift from heaven.
3. Quran has been used to justify miraa chewing. One writer, quotes a group of moslems in Yemen as saying:

"We read Quran and we bow to the Prophet because this plant is known to the Saints and it permits us to keep vigil long through the night in order to worship Allah".
4. In some literature, miraa has been referred to as Akl al Salikin (food of the pious) or Kutessalakin (Sustenance of the pious).
5. There is a contrary view expressed regarding the acceptability of miraa in Islam.

Dr A. A. (member of Big scholars Committee and Member of Permanent Committee for IFTA and Islamic Research, DARUL IFTA, Riyad, Saudi Arabia) cited the following as proof of prohibition of miraa in Quran.

- (a) Prophet Mohammed - Allah's peace be upon him - forbids every intoxicant and depressant as indicated in this quotation

God thus said  
 Ye who believe  
 Approach not prayers  
 With a mind befogged  
 Until ye can Understand  
 All that ye say

The assumption is that the interval between mid-day prayer and afternoon prayer or evening prayer and night prayer are too short for a miraa chewer to have recovered fully.

- (b) Yet another quotation reads:

Ye who believe  
 Intoxicants and gambling  
 (Dedication) of stones  
 And (divination by) arrows  
 Are an abomination  
 of Satan's handwork  
 Eschew such abominations  
 That ye may prosper.

The assumption here is that miraa is an intoxicant.

- (c) In case of doubt, the Quran says Renounce that which inspires doubt in favour of that which does not give rise to doubt.

Pharmacological and Toxicological studies have been used by Moslem scholars to discredit miraa chewing. They are invoking one verse in Quran which commands moslems to avoid, "bad and impure things". In this context, the abnormal discharge (spermorrhoea) after urination, associated with miraa chewing is highlighted.

Sheikh Adam Sheikh Abdullahi (ministry of Health, Mogadishu, 1983) argued that there is close interaction between social, religious and health aspects of miraa.

7. WHO and International Council on Alcohol and Addiction (ICAA) consider the religious connection as expounded by Islamic scholars as offering the best hope of solving the "miraa problem" in countries such as Djibouti, Yemen and Somalia. In 1956, Saudi Arabia used the arguments advanced by Dr. Ghdaian to justify banning of miraa.
8. Currently, there is no consensus on whether Quran prohibits chewing of miraa or not. It is clear that Prophet Mohammed did not address the issue of miraa directly since, unlike alcohol, it was never a problem in his lifetime. No prominent Moslem scholar has used Quran to justify miraa chewing in the international meetings organised by WHO or ICAA. Whether this reflects a deliberate bias or is representative of the situation on the ground is not clear.

## **MIRAA CHEWING - THE MORAL ISSUES**

In discussing the moral issue arising from miraa chewing one can adopt a philosophical or a pragmatic approach.

From cradle to the grave human beings spend much of their time in pursuit of happiness. Miraa, like many other social drugs, bring happiness to those who chew it. It promotes social interactions and cements bonds of friendship in a world characterised by social stratification and human conflicts. There is a message one gets by observing and talking to ordinary miraa chewers which is difficult to capture in words. Certainly the earlier publications which portrayed miraa chewers as being irresponsible and aggressive seem far-fetched. Both Meru and somali males are temperamental compared to some other ethnic groups in Kenya. This is a fact which may have been overlooked.

Miraa earns a lot of foreign exchange for Kenya and Ethiopia. When the money comes from rich countries, there are no serious moral issues involved. However, when money comes from poor countries such as Djibouti and Somalia, the moral issues arise. In the context of geo-politics, national interests override all other considerations. A case in point is the reluctance by Western democracies to stop nuclear arms development and production despite protestations by the rest of international community. Whether Kenya and Ethiopia should adopt measures that work against their national interests is debatable. Indeed one may argue that it is up to Djibouti and Somalia to take the necessary action. In the past, political expediency forced both countries to rescind legislative measures against importation and use of miraa.

It is an established fact that miraa chewing has some undesirable effects, but these are relatively unimportant compared to those associated with smoking and drinking alcohol. A large proportion of those who chew miraa are moslems who do not take alcohol. They are likely to interpret the response of their christian brothers as a case of "preaching water while drinking wine". The argument that miraa causes male impotence is of little significance in a world where billions of dollars are spent on population control. Similarly the developed countries of the West spend billions of dollars on hypnotic, anxiolytics and antipsychotic drugs yet they do not chew miraa. The argument that miraa induces behaviour changes, and psychosis in particular, should be interpreted cautiously. Many of the cases cited involved urban rather than rural people. If miraa can be shown to induce cancer, hepatotoxicity or nephrotoxicity then an argument to ban it will be convincing.

## CULTIVATION OF MIRAA

1. Miraa is thought to have originated in Harar area in Ethiopia. A more plausible view would be that it was growing in different regions of East, Central and Southern parts of Africa at the same time. Many vernacular names in these parts attest to the widespread use of miraa in these regions.
2. Until the beginning of 20th Century, use of miraa was localised in areas where it grew wild. This is because, unlike cereals it could not be harvested, stored or transported to distant places. It had to be used while fresh.
3. Improved road communication and motor transport meant it could be sent to distant places. To meet the increased demand cultivation was initiated.
4. Technical information on cultivation of miraa is lacking. It is not a recognised cash crop in Kenya. Past effort to interest local Universities and Research institutes in research on miraa has been unsuccessful (Personnel Communication with Ministry of Agriculture, Kenya), a lot of general information on cultivation and harvesting of miraa is available from farmers.
5. Miraa grows under the same climatic and soil conditions as Arabic coffee, early records show that Miraa was growing along coffee in Harar region, Ethiopia in the 13th Century, today it is cultivated along coffee in Hararge Province, Ethiopia, slopes of Jobel Sohr in Yemen and Nyambeni area Kenya. It grows well on well drained moist slopes

- 1,500 - 300 metres above sea level between latitude 1 8°N - 30°S. Nyambeni District lies within one degree on either side of the equator and 37°-38° East, longitude. Rich loamy soil (volcanic soil) is particularly good for cultivation of miraa. The wet season must be interposed with hot dry intervals. Miraa produced during rainy cold season is said to be less potent than that produced during warm or hot dry seasons. In the market Leboitype (high moisture content) is considered inferior to Kangeeta or Giza type with low moisture content.
6. In cultivation of miraa, vegetative propagation is applied using suckers or rooting branches arising from underground near the stem. .This is usually done during the heavy rain season, spacing is normally 3-4 metres between plants. The plant takes 4-6 years to yield its first crop which is considered to be of low quality. Intercropping with potatoes, beans is common to maximise on land use. The branches spread out and bend under the heavy weight of the foliage. A good yield is normally obtained after 8-10 years. The older the trees, the more potent the miraa (shoots) is. Trees over 30 years old are said to produce good miraa.
  7. Applying fertilizer or manure to miraa trees gives fleshy material of poor quality. There is no viral or fungal disease known to attack miraa. Some insect pests are known to attack miraa leading to stunted growth. According to one miraa farmer, spraying of miraa with insecticides is prohibited by Njuri-Ncheke, the traditional council of elders in Meru. It is not clear why the intervention of Njuri-Ncheke was considered necessary.
  8. Harvesting of miraa is done mainly towards the end of the wet season for maximum yield. Young agile boys of school going age are normally

employed to pick miraa. The young tender shoots that grow directly from the main stems and old branches are picked about twice a week. The yield varies from season to season and depending on the age of the tree.

The harvested shoots are first tied in twos (if they are long) or 4-5 (for very small ones e.g. giza) to form an "apa". Ten apas are tied together to half bandari. Two half bandaris are tied together to form bandari wrapped in fresh green banana leaves and secured with a dry banana fibre. Ten bandaris are finally wrapped together with green banana leaves to form a bunda. The bunda is the major wholesale exchange unit while bandari is the retail exchange procedure, particularly for export market.

9. Miraa is accepted as fresh for a period of up to 4 days (Leboi type) and 2 days (Kangeeta or Giza type) after picking. Miraa is wrapped in green banana leaves to conserve moisture. A bandari, the retail exchange unit weigh 300-400g, so the bunda weigh about 3kg packaged material weigh approximately 9kg per bag.
10. The major problem facing miraa trade is that once the crop is ready, it must be harvested regardless of market and price fluctuations. The price of miraa is high during the dry season, December to February. The harvested crop can not be stored and must be consumed within 1-2 days. Transportation of miraa from the farm to the collecting centres, then to the Urban areas and eventually to overseas markets represent a very efficient organisation comparable to military precision. A small miscalculation in timing often translate into enormous loss running into hundreds of thousands of shillings. Miraa is always transported by 4 wheel drive vehicles and nothing is left to chance. There are always standby arrangements in the unlikely event of the

vehicle breaking down. A few "freelance" transporters carry miraa bags belonging to different retail traders.

11. Miraa grows wild in a scattered fashion in other parts of Kenya (e.g. Embu). It may be that the climatic and soil conditions are not as exacting as has been assumed. Research in miraa could shed more light and generate reliable technical data. As a first step, there should be proper documentation of available information.

## INFORMATION GAPS ON MIRAA

1. During the period 1972 - 1982 a lot of progress was made regarding the chemistry of miraa. The isolation of some chemicals was followed by pharmacological studies. Cathedulin alkaloids were isolated from fresh miraa material obtained from Kenya, Ethiopia and Yemen Arab Republic. These compounds with molecular weight 600-1200 are closely related and therefore difficult to isolate. They have not been synthesized and consequently material is not available to carry out meaningful pharmacological investigations.

Similarly, Merucathine and Merucathinone isolated from miraa obtained from Kenya have not been isolated in significant amounts and they have not been synthesized.

From the pharmacological investigations carried out on miraa, it is possible to account for the psychostimulant effects and behavioural changes. These effects are attributed to Cathinone and Cathine present in miraa. The net effect is that the impetus for further research on miraa has been lost.

2. The inclusion of Cathinone and Cathine in the list of Psychotropic substances under International Control was an important landmark. However the legal issues regarding cultivation, export and use of miraa have not been defined prompting individual countries to take unilateral decisions.

The distinction between miraa and the psychostimulant substances isolated from it is comparable to that of tobacco and nicotine. Both miraa and tobacco (read cigarettes) are social drugs and banning them would have far reaching implications, socially, culturally and economically. It has been said,

perhaps with justification, that research on miraa is misplaced because it seeks scientific answer to what is essentially a political question.

3. Research on miraa during the period 1972-1983 was done due to the tireless effort of Dr O. Braenden who was Director, UN Narcotic Laboratory, Geneva. He solicited and obtained funding for the research. He also recruited highly motivated scientists. Dr Braenden retired as Director of the UN Narcotic Laboratory in 1983 and passed away some years later. With the death of Dr Braenden and inclusion of Cathinone and Cathine in the list of Psychotropic Substances under International Control research on miraa was downgraded. The focus on miraa research may have to shift to the national level as further funding at international level will be unlikely in the near future.
4. In the past, long term use of miraa has been associated with insanity (Carothers, E. Afr. Med. J. 22, 4-6 1945; Dhadphale, Arap Mengech and Chege E. Afri. Med. J.58 130, 1981). Several people who chew miraa also use other psychotropic substances.

Retrospective and prospective epidemiological studies should be initiated to shed light on this point. At present association between miraa chewing and psychosis is unconvincing.

5. Long term use of miraa has been associated with decreased libido and even impotence. Both Cathinone and Cathine have effects similar to d-amphetamine. The latter has been associated with impotence among drug addicts. Use of amphetamine among drug addicts is different from the deeply rooted cultural practice of chewing miraa. The inference that the latter cause impotence because it contains

amphetamine-like substances need to be confirmed through epidemiological studies of chronic miraa users. The incidence of male impotence in the population is small and statistical considerations are necessary to evaluate miraa chewing as a possible cause of impotence.

6. As detailed elsewhere in this document, information regarding cultivation of miraa is inadequate. It is necessary to redress the situation. Scientific curiosity alone would justify undertaking research on cultivation of miraa.
  
7. Both Cathinone and Cathine have been synthesized in the laboratory. Fresh miraa material can not serve as a source of these two compounds because the starting raw material is prohibitively expensive and the isolation procedures laborious. Use of miraa leaves as a beverage have not been explored fully. The 2 phenylalkylamines present in miraa are potent psychostimulant (more than caffeine). In the past miraa was used as "tea" under the names "Abyssinian tea" or "Arabian tea". Early explorers to Abyssinia could not differentiate coffee from miraa as both were used for the same purpose and in the same way.

Research into alternative utilization of the crop should be carried out.

Miraa is both a crop and medicinal plant and therefore research on the plant to shed light on many unanswered scientific questions is necessary.

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