

## **Chenopodium ambrosioides (Chenopodiaceae)**

(Syn.: *Teloxys ambrosioides*, *Atriplex ambrosioides*)

**English:** Skunkweed, Mexican tea, epazote, Westindian goosefoot, hedge mustard, Jerusalem parsley, sweet pigweed, wormseed **French:** Epazote, The du Mexique  
**Dutch:** Welriekende ganzenfoet, Amerikaans wormsaad, wormkruid, wormsaad  
**Spanish:** Epazote, paico, yerba de Santa Maria **Portug:** Formigueira, erva formigueira, erva de Santa Maria, mastruco, mentruz  
**Chinese:** Chou ching, Chau hahn  
**German:** Mexikanischer Traubentee, Mexikanisches Teekraut, Jesuitentee, Karthäusertee, Wohlriechender Gaensefuss  
**Pharmaceutical definition:** *Chenopodii ambrosioides herba*, *Chenopodii oleum*

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### **The plant**

An annual or perennial shrub, grows up to 1m high, leaves simple, alternate, occasionally opposite, lacking stipules, 2 - 12 cm long, 2.5 – 9 cm wide, blade linear to broadly triangular in outline, margins entire serrated, serrate-dentate or lobed, with inflated glands, in senescence silvery shining. Inflorescences green, herbaceous, widely ramified, branches with flowers originate in the axilles of great leaves which are reduced in their upper parts. The bracts of the fruits green or brown, seeds one per flower, reddish brown,

### **Plants parts used:**

Dried leaves, flowers, and seeds. Fresh parts for tea.

### **Constituents**

**Terpenes:** The main component of the **whole plant** is ascaridol (45-70%). Its content is very variable and depends from the environment and the time of harvesting. Because of its toxicity the content should not exceed 62 – 65 % for pharmaceutical preparations.

In the **aerial parts** the content of ascaridol varies between 0.8 % - 1 % of dry matter. The **seeds** have a higher content.

In organic extracts of **aerial parts** further monoterpenes of lower content were found. Their derivatives are alpha-pinen, thymol, myrcen, cymen, terpinen, campher, trans-isocarveol (2).

The content of ascaridol in the epazote from Mexico is said to be lower than in the epazote from Asia or from Europe.

**Further compounds:** An assay with the ethyl acetate extract for flavonoids in **fresh leaves** of *Chenopodium ambrosioides* afforded two kaempferol glycosides with a yield of 0.046 %. One of them, until up being unknown was named ambroside (23). In an other **oil** the following compounds were found: Phenols 17 %, a C<sub>29</sub> – paraffin, heptacosane-14-one, alpha-spinasterol and triacontylalkohol (26).

**The essential oil:** A colourless or yellow fluid with a bitter taste and a characteristic smell, mp 221 - 223<sup>0</sup> C. Today it is only used in veterinary medicine, no more with men.

A commercial sample of **oil from Madagascar**, analysed by GC, mainly consisted of ascaridole (41.8 %), isoascaridol (18.1 %), p-cymen (16.2 %), alpha-terpinene (9.7 %) and limonen (3.8 %) (1).

## **Traditional uses:**

Mexican tea or Epazote is a native herb of Central America and Mexico. It is one of the most popular plants there. Its flavour is pungent and a little bit resinous. It can grow in other warm or subtropical countries as an invasive weed.

Residents transplant bushes in their houseyards and villagers regularly drink “bush tea” against stomach discomfort and especially against intestinal worms (15 - 20 g fresh leaves for 1 L water, boiling for 1 Minute). This species is used as a vermifuge throughout the Caribbean (named sime kontwa), in Mexico and in Guatemala (3). In New Mexico Hispanic and Mexican people use *Chenopodium ambrosioides* plants against many disorders according to the recommendations of the indigeneous healers, so called curanderos, as emmenagogue and abortifacient. Mexicans hold it in high regards as a remedy afflicting various problems of women. Infusions (30 g for 1 L water) of this plant are said to bring on their periods if pregnancy is suspected. Leaves are preferred to the seeds (3). The variety “ambrosioides” (Spanish: epazote) is popular as a dietary condiment, especially in many bean dishes, because of its carminative effect.

The essential oil of *Chenopodium ambrosioides* prepared by water steam distillation of the fresh plants is included in the United States National Formulary and in the British Pharmacopoeia:

”It is a pale yellow to orange yellow liquid, having a peculiar, unpleasant odour, and a bitter, burning taste. It dissolves in 8 volumes of 70 % alcohol. It becomes brownish by aging. It should be used exclusively as an anthelmintic, especially against roundworms of dogs. It has a burning taste and causes salivation and gastric irritations and should be used with care because of the danger of poisoning, especially with children and aged or malnourished persons” (24,25).

Reports on toxicity of the oil are contradictory. Besides the Pharmacopoeias there are no exact informations in newer literature on serious toxic reactions in humans (4). But here are other new informations about the toxicity of the oil against other organisms.

**Nowadays one can order Mexican tea (herb) via internet ([www.wildacker.de](http://www.wildacker.de)).**

## **Results of experimental studies**

### **Effects of the whole plant and the leaves:**

Among 20 South African plants used to treat pulmonary diseases an acetone extract of *C. ambrosioides* was effective against a resistant H37Rv strain of *Mycobacterium tuberculosis* at 0,1 g/mL (5).

In an inquiry among the rural population of the costal area in Bahia State, Brazil about treatment of cutaneous ulcers induced by *Leishmania braziliensis* a list of 49 plants was collected. Among these 33% of the people identified “mastruz” (*C.ambrosioides*) as the main plant they use to apply. The range of mentioned plants was 65-2% (6).

The leaves of *Chenopodium ambrosioides* (mastruz) are traditionally used for the treatment of many diseases including the cancer. But there are no such results on tumour development in vivo. In a study authors report the effect of *C. ambrosioides* treatment on Ehrlich tumour cells in mice. In the Swiss mice the tumour cells were implanted in the left footpad (solid tumour) or in the peritoneal cavity (ascitic tumour). To determine the tumour growth the footpad was measured each 2 days until the fourteenth day. Then the feet were weighed. The ascitic tumour development was evaluated after 8 days by quantification of the ascitic fluid and the number of the cells in it. The *C. ambrosioides* extract –no information about its preparation- was administered intraperitoneally before or after the tumour implantation. Compared to control mice the inhibition could be seen in ascitic volume and ascitic tumour cell number, in the tumour bearing foot size and foot weight. The treatment increased the survival of tumour-bearing mice. The authors conclude an antitumoral effect of *C.ambrosioides* (7)

### **Effects on cell cultures**

Paico (*Chenopodium ambrosioides* L.) a traditional medicine from Peru with many applications like anthelmintic, antirheumatic, and other qualities contains ascaridole as the active principle (8).

Ascaridole isolated from *C.ambrosioides* was found to be a potent inhibitor of the in vitro development of *Plasmodium falciparum*. After 3 days the development was arrested by a drug concentration of 0.05  $\mu$ M, and at 0.1  $\mu$ M. No parasites were visible in the in vitro culture. At lower concentrations cultures could not continue to develop normally and ceased to grow at a later stage. The authors judge that the peroxid group of ascaridole is the active part of the molecule (9).

In contradiction herbal infusions and ascaridole-free extracts of *C.ambrosioides* at nematocidal concentrations did not show a detectable effect on a system of carbachol-induced contractions in rat gastrointestinal smooth muscles. *C. ambrosioides* infusions are said to be safer as a vermifuge than the use of the essential oil (10).

In human lymphocyte cell cultures –negative controls included- infusions and decoctions of *C.ambrosioides* were tested for genotoxic effects. Decoctions and infusions of the aerial parts were prepared in the following manner:

10 g air-dried plant material per 100 ml water, for decoction 10 minutes at 100<sup>0</sup>C, for infusion boiling water was poured over 10 g of the leaves and left standing for 10 minute. The concentrations of both extracts added to the cultures were 1, 10, 100, 1000  $\mu$ L extract/ml culture. Following this procedure percentages of lymphocyte cells with sister chromatide exchange and chromosomal aberrations increased, but the mitotic index of the cells decreased, nor was the cell proliferation index modified. *C. album* showed no similar effects. It was used as negative control, therefore (11, 12).

In another work a methanolic extract of *C.ambrosioides* showed cytotoxicity against human hepatocellular carcinoma cell line HEP G2 (22).

### **Effects of the essential oil**

The essential oil of *C.ambrosioides* is irritant to the mucous membrane of the gastrointestinal tract, kidneys and liver. It is used in medicine almost exclusively as an anthelmintic. It must be stored in tight containers and be preserved from excessive heat (24,25).

In an in vitro test out of 16 essential oils assayed for their fungitoxicity against *Trichophyton rubrum* and *Microsporon gypseum* *C.ambrosioides* oil showed a strong activity. In formulations of ointments it was able to cure an experimental ringworm infection in guinea pigs within 7 to 12 days (13).

The development of *Lucilia serigata*, a widely distributed Egyptian arthropode, can be inhibited in its third larval state by the use of 70 ppm of the volatile oil. This application is recommended by the author instead of the use of chemicals for controlling the insecticidal pest (14).

For the protection of maize kernels against *Aspergillus flavus* among 11 oils *C. ambrosioides* (here synonym *Teloxys ambrosioides*) caused a total inhibition of fungal development. The optimal concentration was 3 to 8 %. No phytotoxic effect on germination or corn growth was detected (15).

An emulsifiable concentrate (UDA-245) based on essential oil extract of *C. ambrosioides* was tested against insect parasites in greenhouses and compared with commercially available pesticides. UDA-245 with 0.5-1 % oil from *C.ambrosioides* was more effective than Neem oil or endosulfan against aphides or mites. It was not phytotoxic against plants cultivated in the green houses. Authors recommend this material in the pest management of greenhouses instead of chemicals (16,17).

Among 14 plants of Moroccan folk medicine tested for molluscicidal activity the hexan extract of *C. ambrosioides* was most active against the schistosomiasis-transmitting snail *Bulinus truncatus* with LC 90 of 2.00 and 2.23 mg/L (18).

## Results of clinical studies

In a rural community of Huaraz, Peru, a therapeutical clinical trial about the efficacy of “Paico” (*Chenopodium ambrosioides*) compared with the chemical Albendazol (INN: methyl-5n-propoxythio-2-benzimidazol-carbamate) was performed during May and August 2000.

60 children being between 3 and 14 years old were randomly divided in a group treated with Paico (n = 30) and another group treated with Albendazol (n = 30). But no placebo group was included. All children were positively tested for *Ascaris lumbricoides* in faeces. The treatment consisted in Paico juice (no information about its preparation):

1 ml/kg for children, less than 10 kg,

2 ml/kg for larger children.

One dose before breakfast for 3 consecutive days.

The Albendazol administration was a single dose of 400 mg in children over 5 years and 200 mg in younger ones.

The stool examinations were performed in all cases on entering the study and 15 days after the treatment.

**The primary target parameter was the complete disappearance of *Ascaris* eggs and the additional quantitative parameter was the decrease of the parasitic burden.**

The investigations were executed in the laboratory of the Regional Health Authority in Ancash. The eradication rates of *Ascaris* for Paico and Albendazole were around 86 %. The quantitative effectiveness was 59.5 % for Paico and 58.3 % for Albendazole.

The authors conclude that Paico and Albendazole have a similar efficacy against *Ascaris lumbricoides*. Paico had the additional benefit of being effective against *Hymenolepis nana*, too (19).

In two villages near Tarapoto, San Martin, Peru another study about the efficacy of Paico (*Chenopodium ambrosioides*) was performed. Extracts from the leaves of “Paico” (no information about the preparation) were given to 72 patients with intestinal parasitic infections. Their stools were examined before and 8 days after the intake. With respect to the parasites tested the efficacy was 100 % for *Ancylostoma* and *Trichuris*, and 50 % for *Ascaris*. There was no significant difference in age or sex (20).

## Dosages and instructions for the use

### Tea preparation:

15-20 g fresh leaves in 1L water, needed to be boiled for 1 minute.

### Against roundworm infestation in adults:

Two or three doses from 0.2-0.3 ml each, at intervals of one or two hours.

### Against hookworms in adults:

Two or three doses of 0.5 - 1 ml each.

For children or malnourished persons doses should be reduced according to the age:

For children 0.5 ml per year of age divided into two or three parts.

## **Chenopodium oil**

**Maximum single dose: 0. 5g**

**Maximum daily dose: 1.0g**

### **Application against intestinal worms**

**With children:** As many droplets as years of age, at most 10 droplets

**With adults:** 8 droplets once or three times daily, with intervals of 3 hours.

Convenient doses should be administered in gelatine capsules.

**The application must be followed by a salinic purgative such like magnesium sulfate (5-20 g dissolved in water).**

**It must not be repeated in less than two or three weeks (24, 25).**

### **Toxicology**

With proper care Chenopodium oil is a relatively safe anthelmintic.

Symptoms of poisoning by Chenopodium oil, which usually begins several hours after the intaking of the oil are nausea, vomiting, headache, and ringing in the ears. Respiration becomes slow and blood pressure falls. Haematuria and albuminuria or jaundice was observed.

In most cases of the milder forms of poisoning the symptoms usually pass off spontaneously. In fatal cases there are convulsions and coma. In this situation a treatment with magnesium sulfate, a high fluid intake and circulatory stimulants like atropin and epinephrine are recommended.

According to older reports before 1946 twelve cases of serious poisoning could be found of which nine ended fatally (24,25).

There are no exact informations about the quantity of Chenopodium herb, fresh or dried which could be effective against worm infestations in men, nor the content of ascaridole in the juice of Chenopodium applied in Huaraz, Peru is known. One can only say the applied dose was equivalent to an amount of the chemical Albendazol (19).

### **Evaluation**

Chenopodium is a widely distributed herb in the Caribbean countries, in Middle and South America. It is used, fresh or dried, by indigenous people for tea preparations. The permanent use of this tea can be irritant for the mucuous parts of the intestine. The drinking must be discontinued, then.

Chenopodium oil is known as an effective anthelmintic because of its content of ascaridole.

It is widely used. But the application must be followed by a treatment with a salinic purgative, immediately. (24, 25).

### ***Chenopodium ambrosioides***

<b>for tea preparations</b>	<b>***</b>
<b>as anthelmintic together with a salinic purgative</b>	<b>* *</b>

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