

**INVESTIGATION OF THE ALKALOIDAL
CONTENT OF LOCAL HYOSCYAMUS
ALBUS L.**

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This project in Pharmacognosy studies a local medicinal plant - *Hyoscyamus albus* L.. For centuries, *Hyoscyamus* species have been used for their medicinal properties, and they are amongst the most widely used medicinal plants today, due to their alkaloidal constituents, hyoscyamine and hyoscyne. The species which is *Hyoscyamus niger* L..

Hyoscyamus Albus L., commonly known as White Henbane or Mammazejza, is so called due to the pale yellow colour of its flowers. It is a coarse pale green hairy sticky plant with branching stems and petiolate leaves and a slightly unpleasant odour.

It is a native of the region of the Mediterranean and is cultivated in the South of France and in Cyprus. It is found growing in arid, waste places in Malta, Gozo and Comino and is very common along roads, around old buildings and fortifications, on heaps of rubbish, along walls of fields and on rocks in areas close to the sea.

Medicinal Constituents

The alkaloids, hyoscyamine and hyoscyne, belong to the class of Solanaceous alkaloids, the most important member of which is atropine, which is the racemate of hyoscyamine, racemisation occurring fairly rapidly.

These alkaloids are antimuscarinic drugs, i.e., they act by competing with acetylcholine and other muscarinic agonists for a common binding site on the muscarinic receptors. The receptors affected are those of peripheral structures that are either stimulated or inhibited by muscarine, i.e., exocrine glands and smooth and cardiac muscle, and also the non-innervated receptors on the blood vessels and in the C.N.S.

Thus, these alkaloids find application in ophthalmology as mydriatics, in gastrointestinal disease as antispasmodics, in anaesthesia and in cardiac disease. They can also be used as antiparkinsonian agents and for the prevention of motion-sickness, mainly hyoscyne, due to their effects on the CNS.

Quantitative Analysis of *Hyoscyamus albus* L.

The objective of this study was to investigate quantitatively the alkaloidal content of local *Hyoscyamus albus* L. and compare it to that of the official plant, *Hyoscyamus niger* L..

Different parts of the fresh mature plant, gathered in the flowering stage, were analysed, i.e., the leaves and flowering tops, the stems with fruits, the bare stems and the roots, in order to establish which parts of the plant are richest in alkaloids.

Leaves of young plants, which occur as rosettes very close to the ground, were also analysed in order to show whether the alkaloidal content varies with growth of the plant.

Preparation of the plant material for analysis involved drying the fresh plants in an air oven at a temp. of 55° for 48 hours, to reduce them to a dry enough state to enable grinding and sieving. Very fine powders were ultimately produced, which were then assayed.

The method of assay used in this study was the official method as stated in the B.P. (1988). This is a proximate assay i.e. *Hyoscyamus albus* L. was assayed chemically for total non-volatile bases by extracting the drug, using a continuous extraction method, namely the soxhlet, titrating the purified alkaloids and calculating the alkaloidal content, in terms of the principal constituent, hyoscyamine.

Since the B.P. (1988) requires that the stated percentage alkaloidal content refers to the material dried at 100 - 105°C, 2gm samples of the different plant material were dried to constant weight at 103°C, and the calculated moisture content was then deducted from the total weight used in the assay so that the alkaloidal content was calculated as a percentage of this value.

Table 1: Percentage Alkaloidal content, with reference to the material dried at 100 - 105°C, of the different parts of local *Hyoscyamus albus* L.

Sample	% Alkaloidal Content
Roots	0.127
Stems with fruits	0.095
Bare stems	0.080
Leaves and flowering tops	0.060
Young leaves	0.034

According to Duke (1989), the leaves and flowering tops and the roots of the official plant *Hyoscyamus niger* L., contain 0.04 - 0.08% and 0.16% of total alkaloids, respectively. There are no recorded values for the stems.

On comparing the results in Table 1 with the above values it was evident that the alkaloidal content of the local plant was quantitatively similar to that of the official plant, *Hyoscyamus niger* L., indicating that the local plant could be used as a source of hyoscyamus alkaloids on a large scale basis.

Furthermore, it was observed that the roots and stems, which constitute the bulk of the plant, contain the highest amount of alkaloids, a factor which is particularly important especially if the plant should be used for large scale extraction of alkaloids.

Judging from the results obtained for the leaves of younger plants, there lies the possibility that the alkaloidal content varies with the growth of the plant, the mature plant at flowering stage having a higher alkaloidal content.

The study also includes an investigation on the effect of temperatures of 100 - 105°C, which are the temperatures recommended by the B.P. (1988) to dry to constant weight, on the alkaloidal content of the mature plant. Thus, samples of leaves and flowering tops, stems with fruits and roots were dried at a temperature of 103°C till constant weight was attained, then assayed.

Table 2: Percentage Alkaloidal Content of *Hyoscyamus albus* L. plant material dried at 103°C

Sample	Percentage Alkaloid Content
Leaves and flowering tops	0.020
Stems with fruits	0.020
Roots	0.022

On comparison with the results recorded in Table 1, where the plant material was dried at 55°C, it was observed that temperatures of 103°C destroy almost all the alkaloids in the plant material.

From this study, it can be concluded that the alkaloidal content of local *Hyoscyamus albus* L. is quantitatively similar to that of the official species, *Hyoscyamus niger* L.. However, since a qualitative investigation was not carried out, it is not possible to say that these alkaloids are also qualitatively similar.

Furthermore, a study of the natural habitat of *Hyoscyamus albus* L. shows that Malta offers ideal conditions for its growth, and therefore the cultivation of *Hyoscyamus albus* L. for commercial purposes in Malta should be seriously considered.

References

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