als on 392 patients with verified diagnoses of lambliaisis and opisthorchiasis. Thus, it testifies about its antipara-
sitic activity. The Karaganda pharmaceutical complex was constructed and put into operation on the basis of
holding «Phytochemistry». The complex has capacity of
2 millions ampoules, 150 millions tablets, capsules and
2 millions soft dosage forms of original competitive phy-
topreparations.

A NEW SPIRO-SESQUITERPENOIDIC
CHROMANDIONE FROM GUM AMMONIACUM WITH
ACETYLCHOLINESTERASE INHIBITORY ACTIVITY

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Attempts to restore cholinergic function have been
considered as a rational target to improve the symptoms
of Alzheimer’s disease. One therapeutic option is the
use of AChE inhibitors which block this key enzyme in
the breakdown of acetylcholine (1). During the last de-
cade the use of herbal medicinal preprations in dementia
therapy has been studied based on traditional medicine
(2). Gum ammoniacum is a gum-resin from Dorema am-
moniacum D. Don which has been used in Unani and Ira-
nian traditional medicine for several indications. A previ-
ous study showed AChE inhibitory activity for a dichlo-
romethane extract of this resin (3). The aim of this study
was the isolation and characterization of active com-
ponents from gum ammoniacum. Extraction of the resin
was performed by sonification with dichloromethane.
The extract was investigated by a respective colorimet-
ric microplate assay and the active zones were identi-
fied via TLC bioautography. Then the active compounds
were isolated using several chromatographic techniques
such as vacuum liquid chromatography, column chro-
matography and counter current chromatography. The
structures of the active components were characterized
by different methods such as one and two-dimension-
al 1H and 13C NMR spectroscopy (COSY, TOCSy, HSQC,
HMBC, NOESY) and mass spectrometry. Two spiro-
sesquiterpenoidichromandiones were characterized as
active components and one of them is a new compound.
Their IC50 values for AChE inhibitory activity were deter-
mined by microplate assay as 77 and 100 µg/ml. The ex-
tact was analyzed by HPLC to determine the concentra-
tion of active compounds in the extract.

Pharmacol Biochem Behav. 75: 513–527. (2) An-
16: 144–156. (3) Adhami HR, Farsam H, Krenn L.

EFFECT OF MARJORAM POWDER (ORIGANUMMAJORANA L.)
AS ANTIbiOTIC GROWTH PROMOTER SUBSTITUTIONS ON
PERFORMANCE AND IMMUNITY OF BROILER CHICKS

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This experiment was conducted to evaluate the ef-
efect of marjoram powder (Origaniummajorana L.) as an
antibiotic growth promoter substitution on performance
and immune responses in broiler chicks. Three hundred
day-old broiler chicks were divided randomly into four
treatment groups included: control (Basal diet), antibiotic
(Flavophospholipol) and marjoram powder at levels of
2 and 4 g/kg in basal diet. Body weight, feed intake and
feed conversion were recorded at 14, 28 and 46 d. Anti-
body titer against Newcastle and Avian influenza (H9 N2)
viruses at 26 d (14 d post immunization), SRBC at 32 d
(6 d post immunization) and heterophil to lymphocyte ra-
tio at 42 d were measured. Results showed that the birds
fed the 2 or 4 g/kg marjoram powder had higher final body
weight than other treatments (P < 0.05). Feed consump-
tion in antibiotic group was significantly decreased. Feed
conversion ratio was not affected by dietary treatments.
Antibody titer against Newcastle and Influenza viruses
were elevated in broiler chicks fed 4 g/kg marjoram pow-
der (P < 0.05). Antibody titer against SRBC, albumin to
globulin ratio and heterophil to lymphocyte ratio were not
affected by dietary treatments. These results suggest that