Short report

Antifungal activity of *Cynara scolymus* L. extracts

X.F. Zhu^a, H.X. Zhang^{a,*}, R. Lo^b

^aResearch Center for Eco-Environmental Sciences and Graduate School, Chinese Academy of Sciences,
Beijing 100085, China

^bYandi Agricultural Development Co. Ltd., Kunming, Yunnan 650217, China

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Abstract

Chloroform, ethanol and ethyl acetate extracts of *Cynara scolymus* L. leaves, heads and stems were tested for their antifungal activity using the agar-well diffusion assay technique. The leaves extracts and the ethanol fractions were found to be the most effective extract against all the tested organisms.

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1. Plant

Cynara scolymus L. (artichoke), leaves, heads and stems collected from a field of Yandi Agricultural Development. Experiment Station, Kunming, China in May 2003. The plant was identified in the Research Center of Eco-Environmental Sciences, Chinese Academy of Sciences, where a voucher specimen was deposited.

2. Uses in traditional medicine

Artichoke extracts are known to possess choleric, cholagogic, antioxidant, anti-HIV, hepatoprotective and inhibiting cholesterol biosynthesis activities [1–3].

* Corresponding author. Tel.: +86 10 62849155; fax: +86 10 62849155.

E-mail address: hxzhang@mail.rcees.ac.cn (H.X. Zhang).

3. Previously isolated classes of constituents

Flavonoids and caffeoylquinic acids polyphenolics [4,5].

4. Tested material

Chloroform (17.5%), ethanol (24.4%), ethyl acetate (12.8%) extracts from the leaves; chloroform (11.5%), ethanol (16.2%), ethyl acetate (7.8%) extracts from the heads; chloroform (CHCl₃) (9.6%), ethanol (EtOH) (12.4%), ethyl acetate (EA) (5.5%) extracts from the stems, all by Soxhlet extraction, respectively. Phytochemical screening [5,6] gave positive tests for flavonoids and sterols (all of the extracts), caffeoylquinic acid derivatives and polyphenolics (ethanolic and ethyl acetic extracts), tannins and sugars (ethanolic extracts).

5. Studied activity

Antifungal: Each extract was reconstituted in the extracting solvent and the concentrations of 12.5, 25, 50 mg/ml (leaves); 25, 50, 75 mg/ml (heads); and 50, 100, 150 mg/ml (stems) were made of each sample. Forty microlitres of each reconstituted sample was tested by agar-well diffusion method [7,8].

Table 1
Antifungal activity of the *C. scolymus* leaves extracts

Microorganism	Zones of inhibition (mm) ^a									References
	Chloroform (mg)			Ethanol (mg)			Ethyl acetate (mg)			
	0.5	1	2	0.5	1	2	0.5	1	2	
<i>Candida albicans</i> ATCC10231	3	7	11	5	8	12	3	6	11	26
<i>Candida lusitaniae</i> ATCC2201	0	0	2	2	4	7	0	1	3	25
<i>Saccharomyces cerevisiae</i> IFFI1611	0	2	3	3	6	9	0	2	4	16
<i>Saccharomyces carlsbergensis</i> ACCC2166	1	4	9	4	7	11	0	3	6	18
<i>Aspergillus niger</i> CGMCC3.316	3	7	11	4	7	13	0	3	6	26
<i>Penicillium oxalicum</i> CGMCC3.4022	2	5	8	3	6	10	0	3	5	27
<i>Mucor mucedo</i> CGMCC3.15	0	0	2	3	5	8	0	0	2	18
<i>Cladosporium cucumerinum</i> ATCC11279	1	3	6	2	5	9	0	0	2	12

^a Values, not including diameter of the well (6.0 mm), are the mean of three replicates.

^b Nystatin (100 µg/ml), 40 µl of solution was applied to each well.

Table 2
Antifungal activity of the *C. scolymus* heads extracts

Microorganism	Zones of inhibition (mm) ^a									References Nys ^b (4 µg)
	Chloroform (mg)			Ethanol (mg)			Ethyl acetate (mg)			
	1	2	3	1	2	3	1	2	3	
<i>Candida albicans</i> ATCC10231	0	0	2	1	3	5	0	0	0	26
<i>Candida lusitaniae</i> ATCC2201	0	0	2	0	2	4	0	0	2	25
<i>Saccharomyces cerevisiae</i> IFFI1611	0	2	4	1	3	5	0	2	4	16
<i>Saccharomyces carlsbergensis</i> ACCC2166	0	2	5	1	3	6	0	0	0	18
<i>Aspergillus niger</i> CGMCC3.316	0	2	5	3	5	10	0	0	2	26
<i>Penicillium oxalicum</i> CGMCC3.4022	2	5	9	3	5	9	0	1	3	27
<i>Mucor mucedo</i> CGMCC3.15	0	2	4	2	5	8	0	2	4	18
<i>Cladosporium cucumerinum</i> ATCC11279	0	2	4	3	6	10	0	0	2	12

^a Values, not including diameter of the well (6.0 mm), are the mean of three replicates.

^b Nystatin (100 µg/ml), 40 µl of solution was applied to each well.

Table 3
Antifungal activity of the *C. scolymus* stems extracts

Microorganism	Zones of inhibition (mm) ^a									References Nys ^b (4 µg)
	Chloroform (mg)			Ethanol (mg)			Ethyl acetate (mg)			
	2	4	6	2	4	6	2	4	6	
<i>Candida albicans</i> ATCC10231	0	2	5	1	3	5	0	0	2	26
<i>Candida lusitaniae</i> ATCC2201	0	2	4	1	3	5	0	0	2	25
<i>Saccharomyces cerevisiae</i> IFFI1611	0	2	6	2	4	7	0	2	4	16
<i>Saccharomyces carlsbergensis</i> ACCC2166	0	3	6	2	5	7	0	2	5	18
<i>Aspergillus niger</i> CGMCC3.316	1	3	6	2	5	8	0	3	6	26
<i>Penicillium oxalicum</i> CGMCC3.4022	2	4	7	3	5	9	0	2	4	27
<i>Mucor mucedo</i> CGMCC3.15	0	2	4	2	4	6	0	1	3	18
<i>Cladosporium cucumerinum</i> ATCC11279	0	3	7	3	5	8	0	1	3	12

^a Values, not including diameter of the well (6.0 mm), are the mean of three replicates.

^b Nystatin (100 µg/ml), 40 µl of solution was applied to each well.

6. Used microorganisms

Listed in Tables 1, 2 and 3.

7. Results

Reported in Tables 1, 2 and 3.

8. Conclusions

All the fractions of the *C. scolymus* (leaves, heads and stems) showed activity against the tested organisms. However, the heads extracts did not show activity below 25 mg/ml concentration, while stems extracts did so below 50 mg/ml concentration. The leaves extracts were the most active among them, and the ethanol extracts showed the highest degree of inhibition. This study suggests a new potential application of *C. scolymus* leaves in the treatment of fungal infections.

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