



## *Anvillea radiata* (Aerial Parts): Antifungal Effect on Mycotoxigenic Fungi

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Received: 22-12-2016; Revised: 24-01-2017; Accepted: 18-02-2017.

### ABSTRACT

In the Algerian Traditional Pharmacopoeia, *Anvillea radiata* is one of most traditional plant remedies. In this work, we tried to evaluate the antifungal activities of most of the chemical constituents extracted from leaves by many solvents and tested on mycotoxigenic fungi isolating soft wheat (*Aspergillus flavus*, *A. parasiticus*, *A. ochraceus*, *A. fumigatus*, *A. niger*, *Penicillium expansum*, *Fusarium oxysporum* and *Alternaria* sp). The nature of the chemical principles revealed by the phytochemical screening makes it possible to foresee interesting pharmacological activities of the plants studied. It's about flavonoids, tannins and saponins. The antifungal activity of four leaves extracts of *A. radiata* were extracted with gradient of solvents (Petroleum ether, Chloroform, Ethyl acetate and Methanol) and the antifungal test results indicated a great potential of antifungal activity specially in dilution 1/100. *Aspergillus* species proved the most sensitive but *F. oxysporum* was less sensible fungus. These results explain that we can use *A. tenuifolius* as a natural antifungal agent to inhibit and to control mycotoxigenic fungi.

**Keywords:** Algeria, *Anvillea radiata*, Antifungal, chemical screening, mycotoxigenic fungi.

### INTRODUCTION

The therapeutic arsenal available on the market for the treatment of fungal diseases now seems limited, facing increasingly virulent pathogenic strains and growing immune suppressed population. It is now essential to discover new therapeutic agents<sup>13</sup>. In Algeria, alternative therapies or complementary therapies, including herbal medicines launched since ancient times. And a medicinal plant is a natural factory for the manufacture of antimicrobial agents that are widely used in the nutrition and the treatment of humans<sup>21,12</sup>.

*Anvillea radiata*, a saharan-Algerian (the Asteraceae family), this woody species (20 to 50 cm) is widely distributed throughout the Sahara where it colonizes Sandy-clay depressions. Recognizable by its blue-green leaves in the form of an elongated triangle and with toothed edge, this plant is remarkable for its inflorescences arranged in broad orange-yellow capitules and surrounded by radiant leaves which gradually pass to the bracts Tough and spicy. In Algeria; This plant is widely used in traditional medicine for the treatment of many diseases: (gastroenteritis, spasms and colic<sup>10</sup> diabetes and stomach pain<sup>10, 8, 9</sup>). The objective of our work was to characterize the extracts by four solvents and evaluated them on eight mycotocogenic fungi isolating from the French soft wheat marketed in Algeria.

### MATERIALS AND METHODS

#### Plant materials

The aerial parts of *Anvillea radiata* were collected from EL Bayadh and Bechar, the south western part of Algeria in

April to June in 2014, at cordinate (32°15'19.4"N ; 0° 06' 01.4"W) and (32°01' 54.7"N ; 0° 24' 40.0"W). The plant was identified by Pr. Mousaoui A., Director of *Laboratory of plants' resources and food security of semi-arid areas of Southern- west of Algeria University of Bechar - BP 417, (08000), Algeria*. This plant was cleaned with ordinary water, dried in well ventilated then ground with an electric grinder to give fine powder.

#### Screening of phytochemicals

The main chemical components in the extracts were characterized by coloured reactions<sup>17,5</sup> alkaloids (reagents of Dra-gendroff and Mayer), the flavonoides (reaction of cyanidine), the saponosides (foam index), the tanins (ferric chlorides), reducing compounds (reagent of Fehling sterols) and terpens (reagents of Liebermann Buchard) and by setting up their chromatographic profiles by CCM.

#### Extract preparation

300g of powder from leave of *Anvillea radiata* was added to four gradient solvents (Petroleum ether, Chloroform, Ethyl acetate and Methanol) by using Soxhlet method advocated by the French pharmacopoeia. All extracts were concentrated in rotary evaporator and stored in the darkness at 4°C until analysis the total solvents extracts obtained were used to prepare solutions of concentration.

#### Antifungal activity tests

##### Fungal species

Eight mycotoxigenic fungi, including *A. flavus*, *A. parasiticus*, *A.ochraceus*, *A. fumigatus*, *A. niger*, *P. expansum*, *F. oxysporum* and *Alternaria* sp were chosen



for this study as It has caused damage in many varieties and stored products<sup>2</sup>. The fungi were obtained from the collections of biology Department, Faculty of science, Bechar University; Algeria.

### Determination of antifungal effects

1/100, 1/250, 1/500, 1/1000, 1/5000 dilutions of extract were added into sterilized agar medium (PDA)<sup>3</sup>. The extracts added were poured into Petri dishes after being well stirred. After cooling the agars, the molds were seeded. The Petri dishes were incubated at 25–27°C. Assays were carried out in duplicates and with control samples.

### Evaluation of antifungal effects

To assess the antifungal effect; The diameters of mycelial growth of molds were measured<sup>15</sup>. The inhibition percentages of hydrosols were calculated according to the following formula:

$$I = (C - P / C) * 100$$

I: inhibition (%); C: diameters of colonies on control Petri dishes; P: diameters of colonies on practiced Petri dishes.

## RESULTS AND DISCUSSIONS

### Phytochemical screening

The phytochemical analysis conducted on *Anvillea radiata* revealed the presence of many compounds (Table 1).

**Table 1:** phytochemical Screening of *Anvillea radiata* (aerial parts)

Compounds	Plant	Leaves of <i>Anvillea radiata</i>
Quinons		-
Anthraquinons		+/-
Alkaloids		+
Terpes		+
Saponins		+
Coumarines		-
Flavonoids		+
Tannins		+
<b>Key:</b> (+) Present; (-) Absent; (+/-) low presence		

Phytochemical screening conducted on the *A. radiata* extracts revealed the presence of the elements has known medical and physiological activities<sup>18,17</sup>. The results obtained during the phytochemical tests reevaluate the most compounds of plant extract were flavonoids, tannins, saponosides and alkaloids; with absence of coumarins and quinones. This is in line with the work done by Djellouli *and al.*

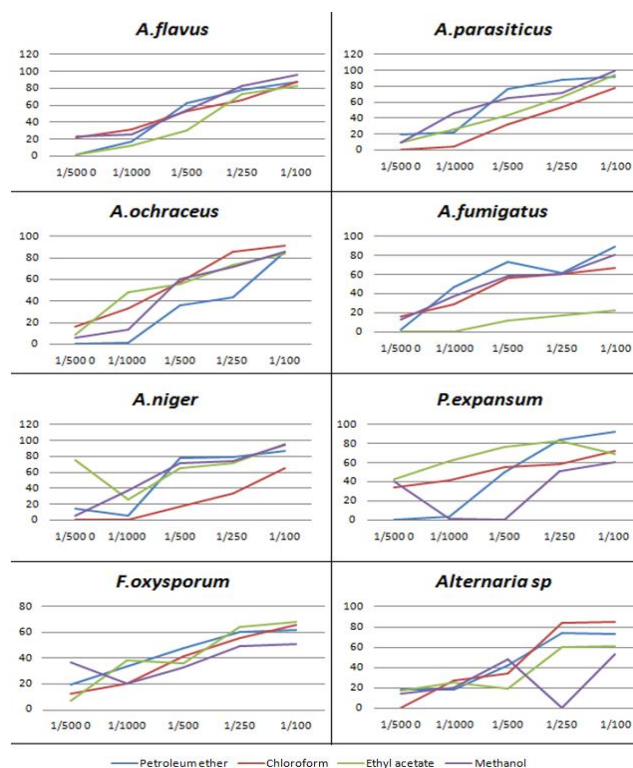
Phytochemical screening is usually carried to characterize the constituents available in *A. radiata*. In general,

antifungal therapies using flavonoids, the saponosides, the tanins and terpenes and their derivative<sup>4</sup>.

The compounds detected by phytochemical tests. All these were previously reported by Mohammed *et al.* (2014). It is the presence of these chemical compounds groups which certainly reinforces the therapeutic virtues of this plant<sup>5,6</sup>.

### Antifungal activity

The anti-fungal activities of the different of the extracts of *Anvillea radiata* are presented in the figure 1.



**Figure 1:** Antifungal activity of *Anvillea radiate*

The antifungal activity of the extracts of the plants obtained was evaluated by the diffusion method in agar medium<sup>11</sup>. The pure extracts are extremely active regardless of the extraction solvent. On the other hand, our results show a correlation between dilution extraction solvent and antifungal effect. In general, all the sensitivity curves show an increasing trend with slopes of varying degrees depending on the extracts, the mold strains and the concentration.

The extract of *Anvillea radiata* with methanol has an inhibitory effect reached 100% on *A. parasiticus* at the 1/100 dilution. A percentage inhibition greater than 80% was marked at the 1/250 dilution in *A. flavus* cases with methanol extract; *A. parasiticus* to petroleum ether extracts; *A. ochraceus* with chloroform extracts; *P. expansum* with extracts of petroleum ether and ethyl acetate; And *Alternaria sp* to the chloroform extracts of *Anvillea radiata*.

The diameter of the colony is reduced every time we increase the dose of the extract so we have significant anti fungal activities against almost all molds studied were highlighted for our extracts of our plant. the plant showed significant antifungal activity. We could also found that leaves methanolic extracts demonstrated strong antifungal activity on both the species than other extracts<sup>14</sup>. The gradient solvents can be explained by the solvent extraction power plays a very important role; It is linked with the polarity of the constituents of the plant *Anvillea radiata*. However, methanol is a more polar solvent than the others has the greatest extraction power of the plant's constituents<sup>19</sup>, particularly relative to the polyphenol fraction<sup>6</sup>. Previous studies indicate that flavonoids of several plant extracts showed antifungal activities<sup>1,7</sup>.

This study identifies our plant extract as the aim antifungal; this study gives important information for the antifungal activity of *Anvillea radiata*. Various extracts of this plant have shown inhibitory effects against mycotoxigenic fungi in vitro<sup>20</sup>.

## CONCLUSION

This study has demonstrated a nature of the chemical principles highlighted suggests interesting pharmacological activities.

These are flavonoids, tannins and saponosides, alkaloids. In continuation we have done studies; Because of our interest in antifungal substances from plant sources, we performed preliminary studies with *Anvillea radiata* collected from Southeast region in Algeria which revealed significant antifungal activity against a number of mycotoxicogenic fungi causing damages in the plants and stored seeds. Methanol was found as a better solvent for extraction of antifungal substances.

Finally, it is recommended to use these plant materials (or especially its compounds). Depending on the antifungal potency of various compounds found in our plant, these differences between the constituents of the extract will be important in nutritional and medicinal uses. Investigations are needed to elucidate this hypothesis.

**Acknowledgements:** This study was a part of the Doctorate thesis (M. Snoussi) at the Institute of Sciences, University of Mascara, Mascara, Algeria.

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Source of Support: Nil, Conflict of Interest: None.

