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Article *in* Natural Product Research · January 2018

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ISSN: 1478-6419 (Print) 1478-6427 (Online) Journal homepage: http://www.tandfonline.com/loi/gnpl20

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To cite this article: David Silva-Mares, Veronica M. Rivas-Galindo, Ricardo Salazar-Aranda, Luis Alejandro Pérez-Lopez, Noemí Waksman De Torres, Jonathan Pérez-Meseguer & Ernesto Torres-Lopez (2018): Screening of north-east Mexico medicinal plants with activities against herpes simplex virus and human cancer cell line, Natural Product Research, DOI: 10.1080/14786419.2017.1423300

To link to this article: https://doi.org/10.1080/14786419.2017.1423300

NATURAL PRODUCT RESEARCH, 2018
https://doi.org/10.1080/14786419.2017.1423300

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SHORT COMMUNICATION

Screening of north-east Mexico medicinal plants with activities against herpes simplex virus and human cancer cell line

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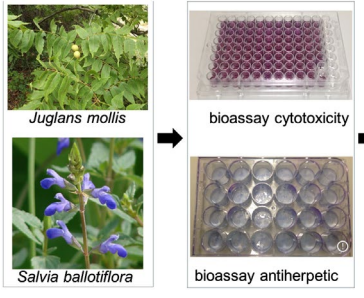
ABSTRACT

The plants examined in this study have previous biological activity reports indicating the possibility of found activity against herpes and cancer cell. The aim of this contribution was to carry out a screening of *Juglans mollis* (Juglandaceae), *Persea americana* (Lauraceae), *Hamelia patens* (Rubiaceae), *Salvia texana* (Lamiaceae), *Salvia ballotaeflora* (Lamiaceae), *Ceanothus coeruleus* (Rhamnaceae), *Chrysactinia mexicana* (Asteraceae) y *Clematis drummondii* (Ranunculaceae), against HeLa cells, VHS-1 and VHS-2. The method MTT was used to determine the 50% cytotoxic concentration (CC_{50}), in Vero and HeLa cell lines. To determine the 50% inhibitory concentration (IC_{50}) against herpes, the plaque reduction method was used. Results showed that none of the plants exhibited activity against HeLa cells. About antiherpetic activity, *J. mollis* and *S. ballotaeflora* extracts present antiherpetic activity in terms of their SI, increasingly interest for further studies on the isolation of compounds with antiherpetic activity and about the mechanisms of action that produce this activity.



CC_{50} HeLa µg/mL	IC_{50} HSV-1 µg/mL	IC_{50} HSV-2 µg/mL
Juglans mollis		
837	76	126
Salvia ballotiflora		
189	31	16

ARTICLE HISTORY
Received 9 August 2017
Accepted 26 December 2017

KEYWORDS
Antiherpetic activity; medicinal plants; antiviral activity; cytotoxicity; *Juglans mollis*; *Salvia ballotaeflora*

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Supplemental data for this article can be accessed at https://doi.org/10.1080/14786419.2017.1423300.

1. Introduction

Herpes simplex viruses 1 and 2 (HSV-1 and HSV-2) belong to diverse family of Herpesviridae, causing oral herpes lesions, genital lesions, meningitis and encephalitis (Knipe and Howley 2013). Is known that herpes simplex is associated with the development of cancer, particularly in the genital area (Cao et al. 2014), resulting in the imperative need to obtain compounds that could be used in the treatment of both diseases. This denotes the importance of research for new drugs with antiherpetic activity. Efforts are currently being made to find new antiherpetic agents from natural resources. There is extensive knowledge in Mexico of the application and use of medicinal plants. Plants that are still used in rural areas (Silva-Mares et al. 2013) as *Juglans mollis* are used for rheumatism, cicatrization, and leucorrhea (Salazar et al. 2008), *Persea americana, Hamelia patens, Salvia texana*, *Salvia ballotaeflora* are used in the treatment of inflammatory conditions, pain or fever (Adeyemi 2002; Ahmad et al. 2012; Silva-Mares et al. 2013), *Ceanothus coeruleus* is used in the treatment of angina and fever, *Chrysactinia mexicana* is used for respiratory affections and *Clematis drummondii* is used as antibacterial (Salazar-Aranda et al. 2011). On this context, we considered important to conduct a screening in plants from northeastern Mexico, with antiherpetic and cytotoxic activity. Therefore, we determined the antiherpetic activity of *J. mollis*, *P. americana*, *H. patens*, *S. texana*, *S. ballotaeflora*, *C. coeruleus*, *C. mexicana* and *C. drummondii,* as well as their cytotoxic activity in Vero and HeLa cell lines.

2. Results and discussion

All plants were collected at the north-east of Mexico, were identified, and a voucher specimen was stored in the herbarium of the School of Biological Sciences of the Autonomous University of Nuevo Leon: *J. mollis* (UAN-14318), *P. americana* (UNL-01436), *H. Patens* (UNL-01458*)*, *S. texana* (UAN-22298), *S. ballotaeflora* (UAN-15925), *C. coeruleus* (UAN-024099), *C. mexicana* (UAN-024102) y *C. drummondii* (UAN-024164). Plant extraction was performed with solvents of different polarity (Table S1). Solvents used here were selected according these previous reports (Miranda et al. 1997; De Almeida et al. 1998; Cruz-Vega et al. 2008; Salazar-Aranda et al. 2011; Ahmad et al. 2012; Silva-Mares et al. 2013). *S. ballotaeflora* had the highest cytotoxic activity for Vero and HeLa cell with a CC_{50} 234 and 189 µg/mL, respectively (Table S1). This result is similar to that reported previously (Silva-Mares et al. 2013). *S. ballotaeflora* also had the highest activity against cancer cells; however, none of the plants demonstrated efficient levels of biological activity with a biomedical value. Moreover *S. ballotaeflora* exhibited the greatest activity against HSV-1 and HSV-2, with an IC_{50} of 31 and 16 µg/mL respectively, followed by *J. mollis* with an IC_{50} of 76 µg/mL and 126 for VHS-1 and VHS-2, respectively (Table S1). The tested extracts of *S. ballotaeflora* had the lowest IC_{50} values against HSV-1 and HSV-2, indicating greater antiherpetic activity. Many species of the Lamiaceae family contain rosmarinic acid, which has been reported to have antiherpetic activity The antiherpetic activity of *S. ballotaeflora* could be due to the possibility of rosmarinic acid may be present in the extract, which increases the importance of performing a bioassay-guided isolation studies to examine the specific compounds responsible for this activity. The plant with the second lowest IC_{50} value was *J. mollis*. This plant was chosen to assess the antiviral activity due to previous reports on antimycobacterial (Cruz-Vega et al. 2008), and antioxidant (Salazar et al. 2008), biological activities. On the other hand, the

activity of *P. americana* was only against HSV-1, reporting IC_{50} values of <12.5 µg/mL (Miranda et al. 1997). We considered important to evaluate the activity against HSV-2 as well, and found a lower antiherpetic activity for HSV-1 than that reported previously (Miranda et al. 1997). A possible explanation for this may be that different strains of HSV-1 were used for each study. In our study, *P. americana* activity against HSV-1 was slightly higher than against HSV-2, confirming that although HSV-1 and HSV-2 have similar characteristics and belong to the same subfamily, Alphaherpesvirinae, can have different clinical, biochemical and serological properties (Yarmolinsky et al. 2009). Selectivity index (SI) was determined for all extracts, *J. mollis* presented the best SI with a value >26 and >15 for HSV-1 and HSV-2, respectively. Our results show that *J. mollis* did not present the best IC_{50} value, but have the best IS value, followed only by *S. ballotaeflora*.

3. Experimental

Experimental data detailed in supplementary material.

4. Conclusions

According to the results, most of the extracts show a specific antiherpetic activity; however, *J. mollis* and *S. ballotaeflora* extracts present the most interesting antiherpetic activity in terms of their SI, increasingly interest for further studies, focused on the isolation of compounds with antiherpetic activity and about the mechanisms of action that produce this activity.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Consejo Nacional de Ciencia y Tecnología [grant number 252846]; the Universidad Autónoma de Nuevo León [grant number PAICyT SA111-15; the Secretaría de Educación Pública [grant number PRODEP DSA/103.5/16/10510].

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