June 2012

Antidiarrhoeal and bronchodilatory potential of Valeriana wallichii.

Arif-Ullah Khan
Aga Khan University

Anwar Gilani
Aga Khan University

Follow this and additional works at: http://ecommons.aku.edu/pakistan_fhs_mc_bbs

Part of the Natural Products Chemistry and Pharmacognosy Commons

Recommended Citation
Available at: http://ecommons.aku.edu/pakistan_fhs_mc_bbs/24
Natural Product Research: Formerly Natural Product Letters

Antidiarrhoeal and bronchodilatory potential of Valeriana wallichii

Arif-ullah Khan \textsuperscript{a,b} & Anwarul Hassan Gilani \textsuperscript{a}

\textsuperscript{a} Department of Biological and Biomedical Sciences, Aga Khan University Medical College, Karachi 74800, Pakistan
\textsuperscript{b} Institute of Pharmaceutical Sciences, Kohat University of Science and Technology, Kohat 26000, Pakistan


To cite this article: Arif-ullah Khan & Anwarul Hassan Gilani (2012): Antidiarrhoeal and bronchodilatory potential of Valeriana wallichii, Natural Product Research: Formerly Natural Product Letters, 26:11, 1045-1049

To link to this article: http://dx.doi.org/10.1080/14786419.2010.551754

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.tandfonline.com/page/terms-and-conditions

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.
Antidiarrhoeal and bronchodilatory potential of *Valeriana wallichii*

Arif-ullah Khan\textsuperscript{ab} and Anwarul Hassan Gilani\textsuperscript{a*}

\textsuperscript{a}Department of Biological and Biomedical Sciences, Aga Khan University Medical College, Karachi 74800, Pakistan; \textsuperscript{b}Institute of Pharmaceutical Sciences, Kohat University of Science and Technology, Kohat 26000, Pakistan

(Received 26 October 2010; final version received 30 December 2010)

This study describes the antidiarrhoeal and bronchodilatory activities of *Valeriana wallichii* D.C. (Valerianaceae). The crude extract of *V. wallichii* (Vw.Cr) caused inhibition of castor oil-induced diarrhoea in mice at 300–600 mg kg\textsuperscript{-1}. In guinea-pig trachea, Vw.Cr concentration dependently (0.03–3.0 mg mL\textsuperscript{-1}) relaxed the low K\textsuperscript{+} (25 mM)-induced contractions, with a mild effect on the contractions induced by high K\textsuperscript{+} (80 mM). In the presence of glibenclamide, the relaxation of low K\textsuperscript{+}-induced contractions was prevented. Similarly, cromakalim caused glibenclamide-sensitive inhibition of low K\textsuperscript{+}, without any effect on high K\textsuperscript{+}. These results indicate that *V. wallichii* exhibits antidiarrhoeal and bronchodilatory activities, possibly through K\textsuperscript{+} channel activation, and thus reveal its medicinal usefulness in hyperactive gut and airway disorders such as diarrhoea and asthma.

**Keywords:** *Valeriana wallichii*; antidiarrhoeal; bronchodilator

1. Introduction

*Valeriana wallichii* D.C. (Valerianaceae) commonly known as ‘Indian valerian’ is a small perennial herb 15–45 cm high, with root stock, thick branching stem, sharply pointed leaves, white or pink flowers in clusters and hairy fruit. It is indigenous to the Himalayas and found in Kashmir, India, Nepal, Bhutan, Burma and Afghanistan. It is also found in different areas of Pakistan, such as Chitral, Hazara, Kurram, Murree hills, Punjab, Swat and Waziristan. The plant is widely known for its use in treating anxiety, insomnia, epilepsy (Nadkarni, 1976), constipation (Baquar, 1989), diarrhoea (Awan, 1990), gastropasms (Kapoor, 1990) and hypertension (Chevallier, 1996). It is also considered useful as a potent tranquiliser (Nadkarni, 1976), diuretic (Said, 1970) and a hepatoprotective agent (Awan, 1990).

The phytochemical studies revealed the presence of multiple chemicals in the plant, such as valepotriates (Becker & Chavadeoi, 1985), dihydrovaltrate (Bounthanh, Bergmann, Beck, Hagg-Berrurier, & Anton, 1981), Linarin-isovalerianate (Thies, 1968), sesquiterpenoids (Ron, Willis, Bone, & Morgan, 2000), 6-methylapigenin, hesperidin (Marder et al., 2003), valerenic acid, isovalerenic acid, valerianine, valeranone, 1-pinene, 1-camphene, terpineol (Nadkarni, 1976), citric...
Table 1. Effect of the crude extract of *V. wallichii* (Vw.Cr) on castor oil (10 mL kg\(^{-1}\))-induced diarrhoea in mice.

<table>
<thead>
<tr>
<th>Treatment (Persa ora)</th>
<th>Number of mice/5 with diarrhoea</th>
<th>%Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saline (10 mL kg(^{-1})) + castor oil</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Vw.Cr (300 mg kg(^{-1})) + castor oil</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Vw.Cr (600 mg kg(^{-1})) + castor oil</td>
<td>2*</td>
<td>60</td>
</tr>
<tr>
<td>Loperamide (10 mg kg(^{-1})) + castor oil</td>
<td>0**</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: *p < 0.05, **p < 0.01 compared to saline group, chi-squared test.

2. Results and discussion

Based on the medicinal use of *V. wallichii* in diarrhoea, its extract was tested for its protective effect against castor oil-induced diarrhoea in mice. The crude extract of *V. wallichii* (Vw.Cr) at 300 and 600 mg kg\(^{-1}\) doses exhibited protective effect against castor oil-induced diarrhoea in mice. The negative control treatment (saline) did not protect animals against diarrhoea. Pre-treatment of animals with Vw.Cr produced 20% protection against diarrhoea at 300 mg kg\(^{-1}\) and 60% protection at 600 mg kg\(^{-1}\) (\(p < 0.05\) vs. saline group). Loperamide (10 mg kg\(^{-1}\)), a standard antidiarrhoeal agent, showed complete protection (100%, \(p < 0.01\) vs. saline group) against diarrhoea in the positive control group (Table 1). Thus, the *V. wallichii* extract inhibited the diarrhoea induced by castor oil. The induction of diarrhoea with castor oil results from the action of ricinoleic acid formed by the hydrolysis of oil (Iwao & Terada, 1962), which alters the transport of electrolytes and water (Gaginella & Phillips, 1975), resulting in contractions of the transverse and distal colon (Croci et al., 1997). Thus, a potential antidiarrhoeal agent may exhibit its antidiarrhoeal effect by inhibiting bowel contractions. We have previously reported that *V. wallichii* rhizome extract exhibits antispasmodic and hypotensive effects, mediated predominantly through K\(^+\) channel activation (Gilani et al., 2005), which may explain the pharmacological mechanism accounting for its antidiarrhoeal action. In view of the known therapeutic potential of K\(^+\) channel openers in congestive respiratory ailments, such as asthma (Pelaia et al., 2002), the Indian valerian was studied in trachea for the possible bronchodilator effect. Vw.Cr caused mild inhibition of high
K⁺ (80 mM)-induced contractions, while completely relaxed the contractions induced by low K⁺ (25 mM) with EC₅₀ values of 0.8 mg/mL (0.6–1.1, 95% CI, n = 4). In the presence of glibenclamide (3 μM), the inhibition of low K⁺ (25 mM)-induced contractions was prevented (Figure 1A). Similarly, cromakalim caused glibenclamide-sensitive relaxation of the contractions induced by low K⁺ (25 mM) with EC₅₀ value 1.6 μM (0.90–2.8, n = 4), without any effect on high K⁺ (80 mM)-induced contractions (Figure 1B). Thus, the V. wallichii extract caused glibenclamide, a blocker of KATP channel (Frank, Puschmann, Schusdziarra, & Allescher, 1994) sensitive relaxation of low K⁺-induced contractions with mild effect on the contractions induced by high K⁺, similar to a standard KATP channel opener cromakalim (Hamilton, Weir, & Weston, 1986), except that it exhibited no effect against high K⁺-induced contractions. This indicates that V. wallichii possesses bronchodilatory action via a combination of dominant ATP-dependent K⁺ channel activation and weak Ca²⁺ entry blocking mechanisms.

Preliminary phytochemical analysis revealed that Vw.Cr contains anthraquinones, coumarins, flavonoids, saponins, tannins and terpenes. The flavonoids are known for their antidiarrhoeal and bronchodilatory activities (Di Carlo et al., 1993; Ghayur, Khan, & Gilani, 2007) and the presence of such class of compounds in V. wallichii, as evident in phytochemical analysis, is likely to contribute to its antidiarrhoeal and bronchodilator effects.

3. Conclusion

In conclusion, this study, by reporting the antidiarrhoeal and bronchodilatory activities of V. wallichii, provides an evidence for its medicinal application in the gastrointestinal and respiratory tract hyperactivity disorders.
Supplementary material

Experimental details relating to this article are available online.

Acknowledgement

This study was supported in part by funds made available by the Pakistan Science Foundation.

References


