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MEDICINAL PLANTS USED IN CHILE FOR THE TREATMENT OF HYPERTENSION AND MOUNTAIN SICKNESS[1]

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Abstract

Hypertension is one of the principal health problems in the society, and an important cause of cardiovascular death in the world. In this work, we present a review of 16 native Chilean plants used in traditional medicine to treat hypertension or mountain sickness, recompiled from manuscripts (books and articles) published regarding medicinal plants. The purpose of this publication is to be a bibliographical source for the eventual study of the active principles contained in the medicinal plants, and the study of the physiological mechanisms underlying such activity, i.e. calcium antagonists and others.

Key words: Chilean medicinal plants, mountain sickness, arterial hypertension, Chile,

Introduction

Stress, fear, pain and competition, exacerbated in our everyday life, are the key factors affecting the modern day man's health, leading to the development of diverse illnesses, (Lorenz, 1984).

The statistics for hypertension in Chile are impressive. In 1965, it was a major cause of retirement of one out of every eleven workers (Medina, 1965). By the 1980's, 20%

[1] The local people calls this kind of mountain sickness: 'apunamiento' or 'mal de altura' due of the local name of the altiplanic place where it was most common. It shows the same characteristic with hypertensión in altiplanic places.

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of the population in the age range of 20-65 suffered from hypertension. This statistic shows that 6% under the age of 20, 18% - 20% above the age of 20 ages, and 47% above the age of 60 (Ministerio de Salud, 1979; Saieh, 1999, Valdes and Roessler, 2002).
While the term "hypertension" is used for altiplanic peoples recently, our ancestors suffered from conditions known as "*mal de altura* in Spanish (mountain sickness characterized with headache, nausea, vomiting, dizziness, fatigue, irritability and coughing.) and *agitación del corazón* in Spanish (tachycardia). During the colonial Chilean period (1800's), it was very common to find people obtaining medicines from herbalists, *comadronas or curanderos* in Spanish, witchcrafts and catholic priests (Leon, 1974).

Medicinal plants are frequently utilized for medicinal purposes in the Chilean rural and semi-rural towns which often lack health centers (Levy, 1988). They also use medicinal plants as one of the therapeutic resources from indigenous and Spanish ancestors (Medina, 1981; Sanchez Tellez, 1984; Lastra, 1988). The work of Akerele (1990) indicated that it is easy to perform "self medication" with different medicinal plants.

This paper presents an exhaustive list of all the known herbs available in Chile for the treatment of hypertension, *mal de altura* (mountain sickness) or *apunamiento (altiplanic word)*. This article has presented unified system for those medicinal plants to be investigated from the fitoquimica and farmacology in searching for new therapeutical tools for mankind. Thus we contribute through this recompilation of studies on Chilean plants to allow a later elaboration of an herbalist pharmacopoeia (Medina et al., 1990; García et al., 1991)

Materials and Methods

This investigation consisted in the revision of data bases in research of articles in books and magazines of Chilean plants that describes uses for endemical plants with cardioactive properties for mountain sickness, hypertension or shortage of breathing.

This investigation consisted in a bibliographical research in scientific publications related with Chilean medicinal plants known to be used in the mountain sickness (apunamiento, shortage of breathing or hypertension). Some of the species are used both in Chile as in Argentina because they are endemic to Cordillera de los Andes.

Results

The research was conducted in sixteen species related to mountain sickness. The results are shown for their scientific and local (popular) names.

1. Scientific name: *Baccharis linearis* Ruiz et Pavón (Family: Compositae) Local name: *romerillo* (San Martín, 1983); chemical studies (Faini et al, 1991; Argandoña and Faini, 1993; He et al., 1996; Faini et al., 1999).
2. Scientific name: *Berberis empetrifolia* Lam. (Family: Berbaridaceae) Local name:

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zarcilla, uva de la cordillera, monte negro (San Martín, 1983; Houghton and Manby,1985; Montes and Wilkomirsky,1985). Isolated benzyl- and Bisbenzyl-isoquinoline alkaloids (Fajardo et al., 1986; Martinez, 2003).

4. Scientific name: *Centaurium canchanlahuen* (Mol) Robinson (Family:Gentianaceae) Local name: *cachanlahue, canchanlahue, cachan-lahuen, cachanlahui* (San Martín, 1983; Houghton and Manby, 1985; Montes and Wilkomirsky, 1985; Montes, 1987; Estomba et al., 2006). Chemical (Montes and Wilkomirsky, 1985; van der Sluis and Labadie, 1985; Peres et al., 2000) and pharmacological studies with vegetable extract in hypertensive rats (Quijada et al., 1985). Biochemical studies (Mansion and Struwe, 2004).
3. Scientific name: *Chaetantera pulvinata* (Phil) Hauman (Family: Compositae) Local name: *flor de la puna* (Palma, 1973; Giberti, 1983).
4. Scientific name: *Chaetantera sphaeroidalis* (Reiche) Hicken (Family: Compositae) Local name: *flor de la puna, poposa* (Hunziker, 1952; Munizaga, 1958; Gunckel, 1967; Palma, 1973; Giberti, 1983; Aldunate et al., 1983; Munizaga, 1988).
5. Scientific name: *Crataegus oxyacantha* L. (Family: Rosaceae) Local name: *peumo extranjero* (San Martín, 1983). Internacional name: Crataegus or hawthorn (Frye, 2003). Phytochemical studies (Ficarra et al., 1990). In cardiovascular desease studies (al Makdessi et al., 1996; al Makdessi et al., 1999; Rothfuss et al., 2001; Miller et al., 2004); hipolipidemic activity (Shanthi et al., 1994); antibacterial activity. (Ng et al., 1996); anticancer activity (Sauter and Wolfensberger, 1989).
6. Scientific name: *Fuchsia magellanica* Lam. (Family: Onagraceae) Local name: *chilco, tilco, fucsia* (San Martín, 1983; Houghton and Manby, 1985). This plant is originally of the origin of climate of Chile (Heusser, 1974; Abarzúa et al., 2004). Chemical (Montes and Wilkomirsky, 1985) and antimicrobial studies (Bhakuni et al., 1974). *In vitro* screening of traditional medicines for anti-hypertensive effect based on inhibition of the angiotensin converting enzyme (ACE) (Hansen et al., 1995).
7. Scientific name: *Modiola caroliniana* (L) Don (Family: Malvaceae) Local name: *pila-pila, pelai-pelai, pela pela, malva común* (San Martín, 1983; Houghton and Manby, 1985; Montecino y Conejeros, 1985; Pauchard et al., 2006).
8. Scientific name: *Muechlenbeckia hastulata* (J.E.SM) Johnst (Family: Polygonaceae) Local name: *quilo, voqui, voqui negro* (Erazo et al., 1987). Chemical studies in secondary metabolites isolated and testing of biological activity with Artemia salina (Toro and Zapata, 1992).
9. Scientific name: *Perezia atacamensis* (Phil) Reiche (Family: Compositae) Local name: *marancel, maransel, maranzel* (Cabrera, 1957; Gunckel, 1967; Giberti, 1983; Giberti, 1985). Chemical studies (De Israilev and Gonzalez, 1994; Catalan et al., 1996).
10. Scientific name: *Senecio eriophyton* Remy (Family: Compositae) Local name: *chachacoma* (Guerra, 1935; Munizaga, 1958; Montes and Wilkomirsky, 1985; Munizaga, 1988). Pharmacological studies on the smooth muscle of the corpus cavernosum of guinea pig with the aqueous and methanol extracts of S. eriophyton were highly effective in a dose dependent manner (more than 90% of relaxation at the dose of 10 mg/ml) (Hnatyszyn et al., 2003).

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11. Scientific name: *Senecio fistulosus* Poepp ex Less (Family: Compositae) Local name: *hualtata, lampazo, lengua de vaca* (San Martín, 1983; Montecino and Conejeros, 1985; Montes and Wilkomirsky, 1985; Garay, 1960; Tang, 1967; Núñez et al., 1972). Phytochemical (Moreno, 1984) and pharmacological studies (Novoa et al., 1990).
12. Scientific name: *Senecio graveolens* Wedd (Family: Compositae) Local name: *chachacoma, chachacoma del campo, chachacoma del cerro, tola, tola hembra* (Cabrera, 1957; Gunckel, 1967; Cardenas, 1969; Palma, 1973; Giberti, 1983; Aldunate et al., 1983). Phytochemical studies (Loyola et al., 1985), chemical composition and antimicrobial activity tests (Anesini and Perez, 1993; Perez et al., 1999); antibacterial activity (Perez and Anesini, 1994), hypotensive properties (Gallardo and Araya, 1982a and 1982b; Cerda, 1986; Araya et al., 1990).
13. Scientific name: *Urmenetea atacamensis* Phil. (Family: Compositae) Local name: *coquilla* (Aldunate et al., 1983). Phytochemical studies (Maldonado et al., 1988).
14. Scientific name: *Werneria incisa* Phil. (Family Compositae) Local name: *poposa, popusa, pupusa, pupusa del cerro, pupusa de agua, pupusa de río* (Cabrera, 1957; Gunckel, 1967; Palma, 1973; Giberti, 1983).
15. Scientific name: *Werneria poposa* Phil. (Family Compositae) Local name: *poposa, popusa, pupusa, pupusa de la ciénaga, akhana* (Cabrera, 1957; Gunckel, 1967; Cárdenas, 1969; Palma, 1973; Giberti, 1983). Phytochemical studies (Ponce and Gros, 1990).

Table 1: A summary of the studies made on the found medicinal plants for the treatment of ease mountain sickness. Nomenclature: PhyS: Phytochemical studies; PhaS: Pharmacological studies; BioS: Biochemical studies; MedS: Medical studies and AntS: Antimicrobial or antibacterial studies.

Scientific name	Family	PhyS	PhaS	BioS	MedS	AntS
Baccharis linearis	Compositae	*				
Berberis empetrifolia	Berberidaceae	*	*			
Centaurium cachanlahuen	Gentianaceae	*	*	*		
Chaetantera pulvinata	Compositae					
Chaetantera sphaeroidalis	Compositae					
Crataegus oxyacantha	Rosaceae	*			*	
Fuchsia magellanica	Onagraceae	*	*			*
Modiola caroliniana	Malvaceae					
Muechlenbeckia hastulata	Polygonaceae	*	*			
Perezia atacamensis	Compositae	*				
Senecio eriophyton	Compositae	*	*			
Senecio fistulosus	Compositae	*	*			
Senecio graveolens	Compositae	*	*			*
Urmenetea atacamensis	Compositae					
Werneria incisa	Compositae					
Werneria poposa	Compositae	*				

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Discussion

Chile is also known for its variety of climates, ranging from desert in the northern part, stretching from the south, and Mediterranean climate into the middle of the country (Cunill, 1980). As a consequence of these climates, Chile has an important diversity of vegetation. This constitutes a natural herbal pharmacological reservation whose valuable potential was well known by our pre Hispanic ancestors.

We present information on a variety of medicinal plants found in our country known to be useful in controlling or treating cardiovascular problems, specifically the hypertension or mountain sickness. As in the case of *Berberis empetrifolia* Lam., various benzylisoquinoline and bisbenzylisoquinoline alkaloids have been isolated (Fajardo et al., 1986, Martinez, 2003). Some of these alkaloids were studied as calcium antagonism: berbamine (Li et al., 1986), tetrandrine (Fang and Jiang, 1989) and 7-O-demethylisothalicberine (Morales et al., 1989).

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