ELSEVIER

Fitoterapia 71 (2000) S1–S5

FITOTERAPIA

www.elsevier.com/locate/fitote

Review

The aphrodisiac and adaptogenic properties of ginseng

Emilia Nocerino, Marianna Amato, Angelo A. Izzo*

Department of Experimental Pharmacology, University of Naples 'Federico II', via D. Montesano 49, 80131 Naples, Italy

Abstract

Ginseng is the root of the perennial herbs of *Panax quinquefolium* and *Panax ginseng* which contain a series of tetracyclic triterpenoid saponins (ginsenosides) as active ingredients. It is considered a tonic or adaptogenic that enhances physical performance (including sexual), promotes vitality and increases resistance to stress and ageing. The adaptogenic properties of ginseng are believed to be due to its effects on hypothalamic–pituitary–adrenal axis, resulting in elevated plasma corticotropin and corticosteroids levels. When used appropriately, ginseng appears to be safe. Nevertheless, documented side effects include hypertension, diarrhoea, restlessness, mastalgia and vaginal bleeding.

Keywords: Ginseng; Ginsenosides; Aphrodisiac properties; Adaptogenic properties

1. Introduction

Ginseng has been used in eastern Asia for more than 500 years as a tonic and restorative, promoting health and longevity. Traditionally, ginseng use has been divided into two categories: short-term, to improve stamina, concentration, healing process, stress resistance, vigilance and work efficiency in healthy individuals and long-term, to improve well-being in debilitated and degenerative conditions especially those associated with old age [1]. Actually ginseng is one of the most popular and expensive herbs in the word. At least 6 million Americans use the root of this slow-growing perennial [2]. The drug is generally administered as a powder, extract

* Corresponding author. Tel.: +39-081-678439; fax: +39-081-678403.
E-mail address: aaizzo@unina.it (A.A. Izzo).

0367-326X/00/$ - see front matter
PII: S0367-326X(00)00170-2

or tea [3]. Although ginseng possesses several pharmacological actions and potential therapeutic applications, this review will focus on the adaptogenic and aphrodisiac properties of ginseng.

2. Botanical and chemical constituents

Ginseng is the root of the perennial herbs of *Panax quinquefolium* L., which grows in Unites States and Canada and *Panax ginseng* C.A. Meyer (Araliaceae). The former is known as American ginseng and the latter, designated Korean or Chinese ginseng, is indigenous to the mountainous forests of eastern Asia. The roots, harvested when the plant is 3–6 years old, are carefully cleaned and dried [3]. Two varieties are commercially available: white ginseng is produced by air-drying the root, while red ginseng is produced by steaming the root followed by the drying. These two varieties have somewhat different compositions of the active chemical constituents [4]. The genus name of *Panax ginseng* was coined by the Russian botanist, C.A. Meyer, and is derived from the Greek terms '*pan*', meaning all and '*axos*' meaning cure. The specie name was derived from the Chinese word '*jen-sheng*', implying the herb whose roots resemble the human body. Thus, *Panax ginseng* means 'the all-healing man herb' [5]. Ginseng is often confused with *Eleuthreococcus senticosus* Maxim (Araliaceae), Siberian ginseng also known as eleuthero, whose roots are used to help fatigue and stress and to improve endurance [6].

Ginseng contains a series of tetracyclic triterpenoid saponins, ginsenosides R_b–R_g. R_b–R_d are derivatives of 20(S)-protopanaxadiol, and R_e–R_g are derivatives of 20(*S*)-protopanaxatriol [7]. The ginsenosides differ in the location and nature of the sugar moieties. At least 13 ginsenosides have been isolated but many of them occur only in small amounts. The saponin content varies between different *Panax* species.

3. Adaptogenic properties

Brekhman, a pioneer in the experimental studies of ginseng, used the term adaptogen to describe the ability of ginseng to increase resistance to physical, chemical and biological stress and to build up general vitality [8]. This effect sets in slowly and several weeks treatment are needed to obtain the full benefit of the drug. The effect of adaptogenic drugs, like ginseng, is particularly evident 'when the resistance of the organism is diminished or … is taxed with extra demands' [8]. Experimental studies have confirmed the adaptogenic properties of ginseng and the effects are apparently a function of the ginsenoside saponin glycosides contained in the root. Indeed, ginseng enhances resistance to X-irradiation, viral and tumour load, temperature stress, hyperbaric hyperoxia, and physical exercise [8,9], augments work capacity in rats [10] and increases swimming time in rats [11]. Many of these activities have been attributed to a corticosteroid-like action and endo-

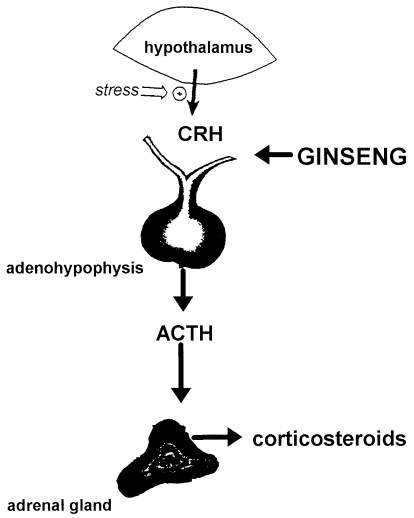

Fig. 1. Possible mechanism of the adaptogenic action of ginseng. Ginseng may augment adrenal steroidogenesis via an indirect action on the pituitary gland. CRH, corticotropin-releasing hormone; ACTH, adrenocorticotropic hormone

crinological studies have suggested that ginsenosides may augment adrenal steroidogenesis via an indirect action on the pituitary gland [12]. The corticosteroid-like action of ginseng is strongly suspected to be responsible of the adaptogenic properties of ginseng as hormones produced by the adrenal gland are known to play a significant role in the adaptation capabilities of the body [10]. Fig. 1 shows the possible mechanism of the adaptogenic action of ginseng.

Ginseng has been used by athletes as an ergogenic aid for many years [13,14]. Pieralisi et al. [14] showed that ginseng preparation was effective in increasing the work capacity, by improving oxygen utilisation, in 50 male sport teachers (21–47 years old).

4. Effects on learning and memory

Experiments with animals have demonstrated the psychomotor effects of ginseng. Petkov et al. [15] showed that oral administered ginseng, at a dose of 20 mg/kg for 3 days, improved learning and memory in rats performing a maze task. Likewise, it has been also shown that oral doses of ginseng improved learning and memory in rats performing shuttle box active avoidance test. The results of this investigation also indicated that high doses of ginseng can impair conditioned-reflex rather than improve it. The positive effect of ginseng on learning and memory could involve an action on serotoninergic transmission [15]. Consistently with these experimental results, D'Angelo et al. [16] showed a favourable effect on various

tests of psychomotor performance (attention, processing, auditory reaction time) in healthy individuals receiving a ginseng extract (200 mg daily for 12 weeks).

5. Aphrodisiac properties

Ginseng is an essential constituent in traditional Chinese medicine for the treatment of sexual impotence. It is likely that this effect reflects the tonic, restorative and adaptogenic properties above reported. However, experimental studies have indicated a specific action for such an effect. Chen et al. [17] have shown that ginsenosides relax rabbit corpus cavernosum and this effect is mediated by nitric oxide, released from endothelial or neural cells. These endothelial and/or neurogenic effects of ginsenosides in inducing relaxation of the corpus cavernosum may account for the aphrodisiac effect of *Panax ginseng*. Consistently with this nitric oxide-linked mechanism, several recent studies have suggested that the antioxidant and organ-protective actions of ginseng, including cardiovascular protection, are related to enhanced nitric oxide synthesis [18,19]. A clinical study has confirmed the positive effects of ginseng on sexual impotence; Choi et al. [20] reported the clinical efficacy of Korean red ginseng for erectile dysfunction (changes in penile rigidity and girth, libido and patients satisfaction) in 30 patients.

6. Other pharmacological properties

A number of pharmacological properties have been reported for ginseng or individual ginsenosides. Ginseng possesses hypoglycaemic activity (increase in insulin release and in the number of insulin receptors) [21,22], has a potent tumour therapeutic activity and improves the cell immune system [23], has antinociceptive (formalin test) [24], hepatoprotective [25,26] and antiviral activity [27] and induces diuretic resistance [28]. Cardiovascular effects of ginseng or ginsenosides have been extensively studied. Many reports describe transient vasodilator actions, in some cases followed by vasoconstriction and increase in blood pressure [19].

7. Side effects, toxicity, and contra-indications

When used appropriately, ginseng appears to be relatively safe. It is considered a food supplement, not a drug, in many countries and most documented side effects are associated with inappropriate use [13]. Nevertheless, the documented symptoms include hypertension, diarrhoea, sleeplessness, mastalgia, eruptions and vaginal bleeding. Siegel [29] indicated the long term effects of the use of ginseng (primarly central nervous system excitation and arousal) as ginseng abuse syndrome (GAS). GAS is characterised by hypertension together with nervousness, sleeplessnes, skin eruptions, oedema and diarrhoea. There is also evidence that ginseng could cause Stevens–Johnson syndrome [30,31].

In general, ginseng should be avoided by individuals who are energetic, nervous, tense, hysteric, maniac or schizophrenic, and it should not be taken with central stimulants, antipsychotic drugs or during treatment with hormones [1]. By inhibiting the uptake of various neurotransmitters, ginseng may potentiate the effect of MAO inhibitors.

References

[1] Newall CA, Anderson LA, David Phillipson J. Herbal medicines. London: The Pharmaceutical Press, 1996.
[2] O'Hara MA, Kieref D, Farrell K, Kemper K. Arch Fam Med 1998;7:523–536.
[3] Robbers JE, Speedie MK, Tyler VE. Baltimore, USA: Williams & Wilkins, 1996.
[4] Shibata S, Tanaka O, Shoji J, Saito H. Econ Med Plant Res 1985;1:217–284.
[5] Li CP, Li RC. Am J Chin Med 1973;1:249–261.
[6] Wong AHC, Smith M, Boon HS. Arch Gen Psychiatry 1998;55:1033–1044.
[7] Samuelsson G. Drugs of natural origin. Stockholm, Sweden: Swedish Pharmaceutical Press, 1999.
[8] Brekhman II, Dardymov IV. Annu Rev Pharmacol 1969;9:419–430.
[9] Sonnerborn U, Proppert Y. Br J Phytother 1991;2:3–14.
[10] Filaretov AA, Bogdanova TS, Podvigina TT, Bodganov AI. Exp Clin Endocrinol 1988;92:129–136.
[11] Grandhi A, Mujumdar AM, Patwardhan B. J Ethnopharmacol 1994;44:131–135.
[12] Hiai S, Yokoyama H, Oura H, Yano S. Endocrinol Jpn 1979;26:661–665.
[13] Bahrke MS, Morgan WP. Sport Med 1994;18:229–248.
[14] Pieralisi G, Ripari P, Vecchiet L. Clin Ther 1991;13:373–382.
[15] Petkov VD, Belcheva S, Konstantinova E, Kehayov R, Petkov VV, Hadjiivanosa C. Phytother Res 1994;8:470–477.
[16] D'Angelo L, Grimaldi R, Caravaggi M et al. J Ethnopharmacol 1986;16:15–22.
[17] Chen X, Lee TJ-F. Br J Pharmacol 1995;115:181–186.
[18] Chen X. Clin Exp Pharmacol Physiol 1996;23:728–732.
[19] Gillis CN. Biochem Pharmacol 1997;54:1–8.
[20] Choi HK, Seong DH, Rha KH. Int J Impot Res 1995;7:181–186.
[21] Guodong L, Zhongqi L. Chin J Integr Trad West Med 1987;7:326.
[22] Yushu H, Yuzhen C. J Trad Chin Med 1988;8:293–295.
[23] Xiaoguang C, Hongyan L, Xioohong L et al. J Etnopharmacol 1998;60:71–78.
[24] Yoon SR, Nah JJ, Shin YH, Kim SH, Choi HS, Nah SY. Life Sci 1998;62:319–325.
[25] Nakagawa S, Yoshida S, Hirao Y, kasuga S, Fuwa T. Hiroshima J Med Sci 1985;34:303–309.
[26] Hikino H, Kiso Y, Kinouchi J, Sanada S, Shoji J. Planta Med 1985;51:62–64.
[27] Singh VK, Greorge CX, Singh N, Agarwal SS, Gupta BM. Planta Med 1983;47:234–236.
[28] Becker BN, Greene J, Evanson J, Chidsey G, Stone WJ. J Am Med Assoc 1996;276:606–607.
[29] Siegel RK. J Am Med Assoc 1979;241:1614–1615.
[30] Dega H, Laporte JL, Frances C, Herson S, Chosidow O. Lancet 1996;347:1344.
[31] Faleni R, Soldati F. Lancet 1996;348:267.