

## MEDICINAL PLANTS: A PROMISING RESOURCE FOR POVERTY ALLEVIATION IN THE MILIEU OF SWAT

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### Abstract

Unlike general agreement on the negative role of poverty alleviation with nature conservation, most modern agreements clearly connect biodiversity and poverty alleviation positively. Besides use in health care systems, harvesting medicinal plants and selling it for livelihood is an important part of most of the poor communities of Pakistan. But the commercial and socio-economic importance of medicinal plants has led the region to over exploitation resulting in depletion of plant resources. A number of research studies have been conducted on the subject in different areas of Pakistan but most of the studies have focused Swat; as the area is rich with medicinally important plants. The number of medicinal plants varies from 55-345 species in Swat but only 52 of these are commonly used and sold. These plants are locally used for the treatments of various ailments i.e. for gastro intestinal problems, arthritis, as anti-helminthic, laxative, for the cure of skin diseases, itching, scabies, eczema and for sore throat and fever. There are almost 2000 medicinally important plant species in Pakistan but unfortunately, the world exports volume of medicinal plants in 2002 was 8.3 million US\$ for Pakistan as compared to 248.6 for Far East, 150.3 for China and 45.8 for India. The medicinal plants resources of Pakistan are also facing numerous issues resulting in depletion of the plants population. The main conservation issues faced by medicinal plants in Swat are overharvesting, deforestation, soil degradation, overgrazing, loss during collection and storage, unmonitored trade, lack of clear resource tenure and custodianships, little understanding of sustainable management parameters and knowledge of market requirement. Steps should be taken to ensure wise use of this potential resource for socio-economic development of people of Swat.

### Introduction

The Convention on Biological Diversity (CBD), the Millennium Development Goals (MDGs), and other international agreements clearly connect conservation to poverty alleviation (Sachs *et al.*, 2009). Kenmore (2004) stated that biodiversity has three broad dimensions, of which poverty alleviation, especially in the least endowed regions is among the most important. In a wide ranging review, Angelsen and Wunder (2003) address the links between poverty and forests focusing on the livelihood of forest dependent people. The Johannesburg Earth Summit (2002) shifted focus to the possibility of banding together biodiversity conservation with poverty alleviation. The production of non-timber forest products (NTFPs) thus became centre of attention in this context (Arnold and Perez 2001; Wunder, 2001). The potential of NTFP production can be explored either by sustainable exploitation from natural forests or cultivation in farming systems (Wong and Hall 2004; Ros-Tonen and Wiersum 2005). Medicinal plants are a promising resource in both the capacities.

Medicinal plants are widely used in the health-care system all over the world ( Mander and Le Breton, 2005; Wyk and Wink, 2004; Jeyaprakash *et al.*, 2011; Goleniowski *et al.*, 2006; Owolabi *et al.*, 2007 ; Papp *et al.*, 2011). They are produced and offered in a wide variety of products, from crude materials to processed and packaged products like pharmaceuticals, herbal remedies, teas, spirits, cosmetics, sweets, dietary supplements, varnishes and insecticides (Ohrmann 1991, Gorecki, 2002; Lange 1996). The potential value of medicinal compounds derived from plants has been proposed as a tangible benefit of biodiversity and therefore a basis for promoting its conservation (Coley *et al.*, 2003). Interest in medicinal plants has been rapidly on the increase in the South Asian region due to growing awareness of their commercial and socio-economic significance. It has also been appreciated extensively that medicinal plants-based ecosystems nurture a high degree of biodiversity. This has not only fostered the spirits of many innovative and progressive growers to adopt this type of farming as a commercial endeavor, but has also led policy makers, donors and development agencies to realize the impending upshot of these plants.



Pakistan has rich history on the folk use of plants. There are more than 6,000 species of higher plants reported 12% of which are used medicinally (Shinwari, 2011). The forest resource base of Pakistan is mostly found in northern areas like Swat and mountains of KPK (Ahmad *et al.*, 2011). The gathering of non-timber forest products including medicinal plants for livelihood is an important aspect of local culture in northern areas of Pakistan. It has been established that about 5000 low income families in northern area depend on collection and marketing of MAPs for their livelihood (Sher *et al.*, 2010). The present paper not only reviews the potential and economic importance of medicinal plants from northern areas, particularly Swat but also tries to highlight





the issues and problems faced by local communities in sustainable development and management of natural resources for poverty alleviation.





**Medicinal Plants in Pakistan:** Globally, there are about 258,650 species of higher plants (Shinwari, 2010), more than 10 percent of which are used medicinally (Gilani and Atta-ur-Rahman, 2005). The flora of Pakistan is very rich due to its diverse climate, soil conditions and multiple ecological regions. Table 1 list selected medicinal plants of Pakistan and their uses. 75 crude herbal drugs are extensively exported and more than 200 are locally traded in Pakistan as per a survey by Pakistan Forest Institute (Humayun, 2007). Karkii and Williams (1999) reported that almost 90% of the 2000 medicinal and aromatic plant species existing in Pakistan are imported and only a few of them are harvested.

There are many studies related to use of medicinal plants of Pakistan. Shinwari *et al.*, (2002) reported that 22% of the plants were used by the locals for gastro-intestinal troubles and 11% of plants used for bronchial and pulmonary ailments in Bar and Shinaki Valleys. A list of more than 500 species of flowering plants was also published in the form of a book by Shinwari *et al.* (2006). A number of studies are published as papers and books on the same topic (Hussain *et al.*, 2008; Ilahi, 2008; Qureshi & Bhatti, 2008, 2009; Qureshi *et al.*, 2009; Abbasi *et al.*, 2010; Qureshi *et al.*, 2010, 2011; Khan *et al.*, 2011). Ethnobotanical studies have also been made in different regions of Pakistan (Table 2).

**Table 1. Selected medicinal plants of Pakistan  
(After Awais, 2009)**

Botanical name	English name	Local name	Family	Parts of plant used	Uses	Image
<i>Cassia fistula</i> (L)	Golden Shower	Amaltas	Leguminosae	Dried leaves and fruit pulp	<ul style="list-style-type: none"> <li>○ Cathartic</li> <li>○ Anti-rheumatic</li> <li>○ Skin diseases like leucoderma, pruritis</li> <li>○ Liver troubles</li> <li>○ Tuberculosis</li> <li>○ Treatment of wounds</li> <li>○ Diabetes</li> </ul>	 <p><a href="http://www.dreddycliric.com/ayurvedic/herts/cc/cassiafistula.htm">http://www.dreddycliric.com/ayurvedic/herts/cc/cassiafistula.htm</a></p>
<i>Trigonella foenum-graecum</i> (L)	Fenugreek	Methi	Leguminosae	Dried seeds, Leaves	<ul style="list-style-type: none"> <li>○ Hypoglycemic effects</li> <li>○ Cholesterol lowering</li> <li>○ Gastrointestinal diseases</li> <li>○ Anti-ulcer</li> <li>○ Colic carminative</li> <li>○ Dysentery</li> <li>○ Diarrhea</li> <li>○ Antipyretic effect</li> <li>○ Emolient</li> <li>○ Respiratory diseases</li> <li>○ Mouth- ulcers</li> <li>○ Aphrodisiac</li> <li>○ Anti-dandruff effects</li> </ul>	 <p><a href="http://www.prlog.org/10720280-fenugreek-latin-name-trigonella-foenum-graecum-drpati-abhay-kumar.html">http://www.prlog.org/10720280-fenugreek-latin-name-trigonella-foenum-graecum-drpati-abhay-kumar.html</a></p>

Botanical name	English name	Local name	Family	Parts of plant used	Uses	Image
<i>Carica papaya</i> (Linn)	Papaya	Papeeta	Caricaceae	Fruit pulp, seeds, roots, leaves.	<ul style="list-style-type: none"> <li>○ Contraception</li> <li>○ Anthelmintic</li> <li>○ Food supplement</li> <li>○ Aphrodisiac</li> <li>○ Anti-inflammatory</li> <li>○ Anti-fungal</li> <li>○ Heart tonic</li> <li>○ Analgesic</li> <li>○ Stomachic</li> </ul>	 <p><a href="http://www.plantsciences.ucdavis.edu/GEP1S/PB143/crop/papaya/papaya.htm">http://www.plantsciences.ucdavis.edu/GEP1S/PB143/crop/papaya/papaya.htm</a></p>
<i>Dioscorea floribunda</i> M. Martens & Galeotti	-	Ratalo	Dioscoreaceae	Dried root tuber	<ul style="list-style-type: none"> <li>○ Antitussive</li> <li>○ Rheumatoid arthritis</li> <li>○ Vasorelaxatory</li> <li>○ Anti-cancer</li> </ul>	 <p><a href="http://agriculture.indiabizclub.com/catalog/271800~dioscorea+(dioscorea+floribunda)~calcutta">http://agriculture.indiabizclub.com/catalog/271800~dioscorea+(dioscorea+floribunda)~calcutta</a></p>
<i>Citrullus colocynthis</i> (L.) schrad.	Colocynth	Korhtumma	Cucurbitaceae	Dried fruit pulp, leaves	<ul style="list-style-type: none"> <li>○ Cathartic</li> <li>○ Diabetes</li> <li>○ Abortifacient</li> <li>○ Treatment of constipation</li> <li>○ Edema</li> <li>○ Bacterial infections</li> <li>○ Cancer</li> </ul>	 <p><a href="http://www.biolib.cz/en/image/id45867/">http://www.biolib.cz/en/image/id45867/</a></p>
<i>Ferula asafoetida</i> (H.Karst.)	Asafetida	Hing	Umbelliferae	dried latex Dried roots, Crushed roots powder	<ul style="list-style-type: none"> <li>○ Asthma</li> <li>○ Common cold</li> <li>○ Coughs</li> <li>○ Toothache</li> <li>○ Gastric problems like ulcer.</li> <li>○ Constipation</li> <li>○ Arthritis</li> <li>○ Diarrhea</li> <li>○ Anthelmintic</li> </ul>	 <p><a href="http://templumdiana.e.forumcommunity.net/?t=56416395">http://templumdiana.e.forumcommunity.net/?t=56416395</a></p>

Botanical name	English name	Local name	Family	Parts of plant used	Uses	Image
<i>Caesalpinia crista</i> (Linn)	Gray nicker	-	Caesalpina ceae	Leaves, flowers, fruit, root, bark, seeds	<ul style="list-style-type: none"> <li>○ Anti-tumor</li> <li>○ Anthelmintic</li> <li>○ Elephantiasis</li> <li>○ Deodorant</li> <li>○ Aphrodisiac</li> <li>○ Leucorrhoea</li> <li>○ Piles</li> <li>○ Wounds</li> <li>○ Ulcers</li> </ul>	 <p><a href="http://homepage3.nifty.com/inagiyasou/photo/iriomote06/jmk2/nantenkazra.jpg">http://homepage3.nifty.com/inagiyasou/photo/iriomote06/jmk2/nantenkazra.jpg</a></p>
<i>Smilax ornata</i> (Lem)	Sarsaparilla	Ashba	Smilacaceae	Dried root and rhizome	<ul style="list-style-type: none"> <li>○ Rheumatism</li> <li>○ Gout</li> <li>○ Skin disorders</li> <li>○ Eczema</li> <li>○ Psoriasis</li> </ul>	 <p><a href="http://www.globalherbalsupplies.com/herb_information/images/sarsaparilla.jpg">http://www.globalherbalsupplies.com/herb_information/images/sarsaparilla.jpg</a></p>
<i>Styrax benzoin</i> (Dryand)	Benzoin	Loban	Styraceae	Incised stem exudates	<ul style="list-style-type: none"> <li>○ Expectorant</li> <li>○ Respiratory</li> <li>○ Catarrh</li> <li>○ Antiseptic</li> </ul>	 <p><a href="http://aromahealthtexas.com/products/benzoin-styrax-absolute">http://aromahealthtexas.com/products/benzoin-styrax-absolute</a></p>
<i>Crocus sativus</i> (L)	Saffron	Zafran, Kesar	Iridaceae	Dried flowers.	<ul style="list-style-type: none"> <li>○ Aphrodisiac</li> <li>○ Anti-depressive</li> <li>○ Expectorant</li> <li>○ Sedative</li> <li>○ Stimulant</li> </ul>	 <p><a href="http://www.qued.com.br/site/index.php/duvidas/o-que-e-acafrao">http://www.qued.com.br/site/index.php/duvidas/o-que-e-acafrao</a></p>

**Table 2. Ethnobotanical studies made in Pakistan.**

S.No	Area	Study carried out by
1	Khyber agency	Afridi, 1986
2	Mansehra	Haq & Hussain, 1993
3	Rawalpindi	Arshad & Akram, 1999; Durrani & Hussain, 2003
4	Kurram	Gillani <i>et al.</i> , 2003
5	Margalla	Shinwari & Khan, 1998
6	Abbotabad	Abbasi <i>et al.</i> , 2010
7	Kotli	Ajaib <i>et al.</i> , 2010
8	Chitral	Ali & Qaiser, 2009
9	Dir Kohistan valleys	Gul <i>et al.</i> , 1999; Ali <i>et al.</i> , 2010
10	Attock	Noor & Kalsoom, 2011

Swat has been a major focus of the studies focusing the documentation and uses of the medicinal plants. Swat district is a land of beautiful valleys situated at the Northwest corner of

Pakistan, having a total area of 5337 sq km (Anonymous, 1998; Humayun, 2007). Ethnobotanically, Swat valley is affluent of medicinal plants which are mostly used by locals for primary health care. The most commonly used plants in this region are *Acorus calamus* as stimulant, emetic, carminative and as expectorant, *Adatoda vasica*, *Dioscorea deltoidea* and *Xantoxylum armatum* as cure of different diseases (Ur-Rahman, 1999, 2000, 2001) and *Hedra helix* as a folk hypoglycemic medicinal plant (Ibrar, 1998; 2000). Aconitum or leaves, *Bistorta amplexicaule*, *Bunium persicum*, *Corydalis govaniiana*, *Ferula narthex*, *Ephedra geradiana* and *Trachyspermum ammi* are some of the important plants mentioned in another study (Ahmad *et al.*, 2011). Different studies reveal diverse number of medicinally important plants of Swat. According to Shinwari *et al.*, (2000), the number of medicinal plants varies from 55-345 species in Swat but only 52 of these are commonly used and sold. According to Islam *et al.*, (2006) there are 49 weed plants found, out of which only 30 plants were used as traditional medicines. Another study conducted in District Swat (Ahmad *et al.*, 2011) revealed that most of 216 medicinal plants were used for the treatments of various ailments i.e. for stomach gastro intestinal problems, arthritis, as anti- helmentic, laxative, for the cure of skin diseases, aching, scabies, eczema and for sore throat and fever.

Studies also reveal that these medicinal plants are collected during spring and summer seasons. Plant collectors are usually local villagers, among 5000 families mostly women and children are involved in this process, collecting and selling medicinal plants as a part time activity and as an extra source of income (Sher *et al.*, 2006). The plants are sold in local markets, while some of them are kept in homes to be used against different diseases. Major proportions of plants collected are sold in fresh while some plants are stored to be sold later on (Humayun, 2007).

**Economic Importance of Medicinal Plants:** Medicinal plants are not only a mean of health care, but make an important contribution to livelihoods of poor communities all over the world (Saganuwan, 2010). World trade in medicinal plants accounts for about 30 percent of the total drug market. The current value of global trade of the medicinal plant products has been put over US\$ 75 billion per year and is growing at the rate of 12.5% annually, expecting to reach \$5 trillion by 2050 (Sharma, 2003; Shinwari, 2010). This percentage excludes plants used for non-medicinal purposes. Bulk of the raw material (90%) is produced in developing countries (Asia, Africa and Latin America) and 60% is imported/ processed and used in the developed countries.

Asia represents the greatest volume of medicinal plants used across regions, both domestically and for export. The international trade of medicinal plants is dominated by only few countries. About 80 % of the world-wide exports of medicinal plants are allotted to only 12 countries with the dominance of China and India as the world's leading producing nations (Lange, 2004). China, which harvests an estimated 80% of its medicinal plant material from wild sources, exports an estimated 32,600 tons of medicinal raw material each year (Parrotta, 2002). India reportedly has an estimated 9000 manufacturing units using almost 1,000 of 7,500 known medicinal species, with an annual domestic market valued at almost US\$1 billion (FRLHT, 2002).

According to Karkii and Williams (1999) almost 2000 medicinal and aromatic plant species are estimated to exist in Pakistan. But unfortunately, we have failed to succeed in the international trade of medicinal plants. The world exports volume of medicinal plants in 2002 was 8.3 million US\$ for Pakistan as compared to 248.6 for Far East, 150.3 for China and 45.8 for India (Lange, 2004). As we know that collection and sale of MAPs is an important economic activity in northern parts of Pakistan (Sher *et al.*, 2006), steps should be taken to ensure wise use of this potential resource for socio-economic development of people of Swat.

**Major Issues:** The medicinal plants are usually used to produce cheaper health related medicines and products. Worldwide, the future of medicinal plants conservation seems threatened due to their increasing use. The medicinal plants resources of Pakistan are also facing numerous issues resulting in depletion of the plants population. The main conservation issues faced by medicinal plants in Pakistan is overharvesting due to trade pressure resulting in loss of biodiversity. In addition, deforestation, soil degradation and overgrazing are also considered important factors responsible for the diminution of many species. Loss during collection and storage, unmonitored trade, lack of clear resource tenure and custodianships, little understanding of sustainable management parameters and knowledge of market requirement also included in the list (Azaizeh *et al.*, 2003; Hussain and Sher, 2005, Sher *et al.*, 2004).

**Depletion due to over Harvesting and Overgrazing:** Over harvesting is the major issue related to medicinal plants resources. It is mainly because of trade pressure which results in depletion of the flora of the area. Shinwari, (2010) reported extinction of many species due to over harvesting in Hindukush Region. Over-exploitation may also lead to decrease in effective population size, which may have great genetic consequences (Cruse-Sanders *et al.*, 2005). Another big issue causing depletion of medicinal plants is the grazing pressure. Although livestock plays an important role economically, findings by Guenther *et al.* (2005) reported a negative relationship between plant population and grazing pressure. Same observation was reported by Ahmad *et al.* (2011) suggesting that proper management of grazing system is important to encourage the regeneration of medicinal plants. Shah (1999) reported that livestock affects the vegetation in three ways: through trampling that reduces the rate of natural regeneration, browsing of small trees and bushes and soil trampling which results in compaction, therefore, less growth of new seedling occurs. Due to lack of knowledge about conservation measures, like controlled grazing, proper harvesting and harvesting at the proper time, some medicinal plants endangered as a result of over-exploitation of the medicinal plants in Chitral (Ahmad and Sher, 2001). In Azad Kashmir, *Saussurea costus* (Falc.) Lipsch. (Kuth) is also over-collected (Gilani *et al.*, 2003) have stated that in Swat 24.5% and in Chitral 22.14% medicinal plants are threatened. Khan *et al.* (2012) and Zaidi (2001) also reported threatening to plant resources in Azad Kashmir.

There is now open agreement that to augment the economically important MAPs, cultivation offers the best solution. A World Bank commentary communicates that "while commercial cultivation of medicinal plants is taking place on a miniscule scale, this activity is poised for 'dramatic growth' in the coming decade" and favors organic and mixed cropping to ensure 'good agricultural practices' (Bodeker, 2005). Cultivation is also essential for the conservation of many endangered and threatened medicinal plants by establishing gene banks and botanic gardens. Many countries of the world have a tradition of Botanical Gardens devoted entirely to medicinal plants. In China, for instance some 5000 plants are grown in botanical gardens and are used regularly by 800 million people (Lewington, 1990). The Chinese Ministry of Agriculture has identified more than 1000 species of medicinal plants that are important and has begun cultivating species which are in high demand. Systematic cultivation of medicinal plants can be introduced by educating the local communities. Nurseries or seed banks of high yielding varieties have to be maintained. Although many studies are available on diversity and uses of medicinal plants from Swat but need of time is to shift the focus of research and development work to ascertain Good Agricultural Practices (GAP) which should include proper cultivation techniques, harvesting methods, safe use of fertilizers and pesticides and waste disposal. It is heartening to find that efforts have been made by Pakistan Forest Institute, Peshawar through the dissemination of packages containing information about cultivation practices, which are presently in use by progressive farmers in different provinces. Research studies have been available regarding the names of the plants, places of cultivation in different provinces and the annual productivity (Zaidi, 2001), sources of procuring the material, soil and climate, propagation, planting, spacing, watering, harvesting, production and storage requirements for more than 50 plants (Rizvi *et al.*, 2007) and cultivation details and propagation of some 278 plants (Usmanghani *et al.* 2007). Though it is encouraging to note that greater attention is being paid to the studies about cultivation of medicinal plants, but the most important step is to adopt effective strategies for dissemination of this information to the poor, common man of the area. So there is a dire need to educate the local people by the intervention of academia and NGOs in the area. The medicinal plants sector can be improved only if the agricultural support agencies and research institutions would come forward to help strengthen the medicinal plants growers. Large scale cultivation by local small farmers can surely bring change in the socio-economic condition of the people of Swat by earning a decent living.

**Loss During Collection and Storage:** In Pakistan, trade and collection of plant materials is mostly handled by unskilled persons (Sher *et al.* 2010, Sikarwar 1996 and Lange 1998). This results in extensive damage to valuable medicinal plants due to lack of scientific methods of collection. Ali (2011) reported a rough estimate of 15% loss of medicinal plants as given by collectors. Reasons include (i) the use of unsuitable equipment for plant collection e.g., bags, shawls and cotton cloth and poorly crafted cutting and digging tools, (ii) Lack of awareness about the desired plant part is also an important factor, (iii) Poor drying facilities (Khan and

Humayun, 2003; Shinwari and Khan, 2001). As the required hygienic conditions are not available while drying, most of the crude drug gets infected with insects and fungi. The poor ventilation and dark storage places results in the deterioration of dried herbal drugs (Shinwari and Khan, 2001).

To save the losses during collection and storage for maintaining the quality of medicinal plants, there is a need to select proper and appropriate technologies. Training of local community involved in the conservation and management of medicinal plants is essential for the development of medicinal plant business for poverty alleviation. They should be trained as per technical guidelines on Good agricultural and collection practices for medicinal plants (GACP) provided by WHO (2003). The trainings should be imparted focusing the factors affecting collection like time of the year, time of the day and stage of maturity and age of the plants. Awareness should also be created that due to over-collection there is biodiversity loss and depletion of wild natural resources, while several species are getting extinct from the area. Improper methods of storing and inadequate protection during storage can cause a pronounced deterioration in the healing abilities of these plants; therefore skilled manpower has to be produced. University of Swat, in particular and other universities in general can play a very important role in this regard by assigning relevant research topics to students and involving them in trainings of local communities. The linkages can foster the profits of the local community from medicinal plants trade.

**Unmonitored Trade and Equity Issues:** Medicinal plants trade relies a great deal on the indigenous knowledge of local people. Lately this has raised apprehensions about fair sharing of the benefits of such knowledge and the intellectual property ('IP') rights of rural communities. In many countries manufacturers of herbal medicines have made contracts with local communities for bulk production of medicinal plants. Such projects are beneficial as they reduce pressure on wild reserves and create employment opportunities for local people. But at the same time, decrease local ownership and control of forest resources, with corporate control of production. This usually works against the interests of primary collectors who are paid very less than the actual value of the product. This compels the local collectors to over-exploit the resources to increment their income (Olsen and Helles, 1997; Karki, 2001).

This major challenge in the area of patents and IPRs on use of medicinal plants can be addressed by introducing International Regulations like "Convention on Biological Diversity" (CBD) and "Trade Related Intellectual Property Rights" (TRIPs). The provisions of TRIPs and CBD have tried to develop a system of protection of traditional knowledge globally, by linking the grassroots knowledge systems with the global opportunities for financing the commercial use of biological diversity. By proper governmental intervention these regulations enable market opportunities to be seized by poor people, remove the barriers to market entry and fair trade in medicinal plant business.

## Conclusion

In addition to extensive use in health care, medicinal plants trade is an important part of most of the poor communities of Pakistan. But this prospective resource is facing numerous issues resulting in depletion of the plants population. Intensive measures are needed to fully exploit the potential of the medicinal plants to get maximum monetary benefits. The medicinal plants sector can be improved only if the agricultural support agencies and research institutions would come forward to help strengthen the medicinal plants growers. University of Swat, in particular and other universities in general can play a very important role in this regard by assigning relevant research topics to students and involving them in trainings of local communities for their skill development. The linkages can foster the profits of the local community from medicinal plants trade. Also, by proper governmental intervention provisions of TRIPs and CBD can be introduced effectively to help the poor farmers get a fair share from the plant business, helping out poverty alleviation from the area.

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