

Comparison on the Wild Relatives of Some Cultivated Plants of Palakkad District, Kerala

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Abstract: Plant breeding programmes are under tremendous pressure to breed for better crop varieties to cope up with increased demand for food coming from rapid and exponential increase of the population. Wild relatives of crop plants have always been source of important breeding traits. Feeble studies have been conducted to document this rich source of genes in Palakkad despite the efforts of NBPGR. In this context we have undertaken a pilot study to document the wild relatives of crop plants of Palakkad district and also enable to understand wild relatives of some commonly cultivated plants. The study reflects that future plant breeding experiments can rely be conducted to improve the crop plants and there by enhance the germplasm on these rich source of useful traits for the production of improved varieties.

Keywords: Wild relatives, Cultivated plants, Palakkad, Kerala.

1. INTRODUCTION

Biological diversity consists of morphological differences between individuals and species which in turn coming from the presence of specific DNA sequences, or due to differences the their location in the genome [1]. From time immemorial natural ecosystems are subject to increasing pressure from habitat fragmentation and the accelerated changes in the environment, placing new demands on the genetic repertoire of plant species. On the other hand, modern biotechnology and genetic engineering provide new tools to extract useful genes from wild species unconstrained by mating barriers to transfer them to related or unrelated species [2], [3].

All cultivated plant species derive directly or indirectly from wild species through domestication. Wild species related to cultivated plants have contributed to the breeding of most crop plants. Wild relatives are commonly used as sources of genes, but they can also provide disease resistant root stocks in horticulture, experimental resources, in character models pathogen differentials etc. This primarily involves Germplasm collection. The principle interest in wild relatives is the wealth of genes for resistance to parasites they have acquired over long periods of co-evolution. The crop improvement by plant breeding experiments also contributes much in the economic and commercial use of the crop plant [4].

LOCATION AND STUDY AREA:

The areas to be surveyed were selected so that they included the diversity of environments and ethnic composition of the Palakkad district. Majority of the plants were collected from Malampuzha which are hilly and fall in the highland region (elevation >250 m) and surrounding areas.

2. METHODOLOGY

The aim of the present study was recording of ethnographical field data of Palakkad district, in order to develop a model for the re-evaluation of tools and technologies related to traditional uses of wild and neglected cultivated plants for food, medicine, textiles, dyeing, handicrafts, and basketry etc., In addition to that, the present study also evaluate the socio-economic and anthropological context in which these plants have been gathered and processed. Field research was conducted by collecting ethnobotanical information from knowledgeable people native in each site territory. The plants were identified [5], [6], photographed and sample specimens were collected for preparation of herbarium. Seed samples were also collected in the appropriate season for the most representative wild plants.

3. RESULTS AND DISCUSSION

A total of 26 plants have been recorded. All these species are native and are gathered from the wild, while 13 of them are cultivated as well. All the plants recorded are presented in Table 1 with the indication of scientific name, vernacular name, family, plant part used and medicinal uses with corresponding figures were also shown (Figures 1-26). The recorded plants belong to 13 different families. 18 plants have been recorded to be used for food as well as for medicine. Overlapping between foods and medicines is quite well known in traditional societies [7], [8], [9] and represents an often neglected field in ethnopharmaceutical research. The identified wild and cultivated plant species were also compared at the morphological level and were recorded in Table 2.

TABLE 1: List of plants collected from Palakkad district

Sl. No	Binomial Name	Family	Vernacular/ English Name	Aromatic Parts Used	Common Uses
1.	<i>Cocos nucifera</i>	Aracaceae	Coconut	Whole	Uses as food. As antitumour, antiseptic, astringent, bactericidal
2.	<i>Arenga wightii</i> Griff.	Aracaceae	Wild coconut	Root, Liquor extracted from flower	For renal diseases
3.	<i>Piper nigrum</i> L.	Piperaceae	Black Pepper	Fruit	Spice. Stomachic, vomiting
4.	<i>Piper argyrophyllum</i> L.	Piperaceae	Kattukurumulak	Fruit	Used by tribals as a substitute for black pepper
5.	<i>Anacardium occidentale</i>	Anacardiaceae	Cashew nut	Fruit and nut	Fruits consumed as delicacy. For cancerous ulcers and elephantiasis
6.	<i>Semecarpus anacardium</i>	Anacardiaceae	Bhilwa	Fruit and nut	Antimicrobial, antiinflammatory, antioxidant
7.	<i>Cajanus cajan</i>	Fabaceae	Pigeon pea	Seed	Used for cooking. for treating diabetes, skin irritations, hepatitis, measles, jaundice, dysentery
8.	<i>Cajanus scarabaeoides</i>	Fabaceae	Showy pigeon pea	Seed	Antidiabetic, antimicrobial
9.	<i>Cucumis sativus</i>	Cucurbitaceae	Cucumber	Fruit	Used as vegetable, consumed raw as salads
10.	<i>Cucumis sativus</i> f. <i>hardwickii</i>	Cucurbitaceae	Wild cucumber, Kattuvellari	Fruit	Antimicrobial
11.	<i>Maranta arundinacea</i>	Marantaceae	Koova	Rhizome	Rhizome used as a staple food, for making delicacies also diuretic
12.	<i>Schumannianthus virgatus</i>	Marantaceae	KattuKoova	Rhizome	Diuretic
13.	<i>Oryza sativa</i>	Poaceae	Rice, Nello	Fruit	Staple food for millions. Rich source of starch.
14.	<i>Oryza meyeriana</i> ssp. <i>granulata</i>	Poaceae	Kara nello, Wild rice	Fruit	Used as a substitute for rice. Drought resistant.
15.	<i>Passiflora edulis</i>	Passifloraceae	Passion fruit	Fruit	Used for making soft drinks, ripe fruits consumed as a delicacy
16.	<i>Passiflora foetida</i>	Passifloraceae	Wild Passion fruit	Fruit	Cattle feed
17.	<i>Momordica charantia</i>	Cucurbitaceae	Pavakka, Kaypakka	Fruit	Used as a vegetable

18.	<i>Momordica charantiasspmuricata</i>	Cucurbitaceae	Kaattupaval	Fruits and Vines	Fruits used as a vegetable, vines consumed to cure diabetes
19.	<i>Abelmoschus esculentus</i>	Malvaceae	Venda	Fruit	Vegetable
20.	<i>Abelmoschus moschatus</i>	Malvaceae	Kattuvenda, Kattukasthuri	Fruit	Seeds used in ayurveda as musk
21.	<i>Vigna mungo</i>	Papilionaceae	Uzhunnu	Seeds	Used as vegetable, also used to make breakfast items
22.	<i>Vigna trilobata</i>	Papilionaceae	Kattupayar	Fruits	Cattle feed
23.	<i>Amaranthus viridis</i>	Amaranthaceae	Cheera	Leafy Stems	Vegetable
24.	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kattucheera, MullanCheera	Leaves	Vegetable, Cattle feed
25.	<i>Pisum sativum</i> L.	Papilionaceae	Pattani	Seeds	Vegetable
26.	<i>Pueraria phaseoloides</i>	Papilionaceae	Kattu Payar	Fruits	Cattle feed

TABLE 2: Morphological comparison of wild and cultivated plants collected from Palakkad district

<p>CULTIVATED</p> <p><i>Cocos nucifera</i></p> <p>Erect trees with annular petiolar scars. Leaves pinnatisect, 4-6 m long; 60-100 x 2.5-5 cm, base narrow, apex tapering, acute. Spadicesinterfoliar, 50-100 cm long, paniced. Spathe 60-130 cm long, oblong, woody. Flowers monoecious, subsessile. Male flowers: often paired. Stamens 6, short. Female flowers 1-3 per branch, basal, globose. Perianth-lobes 6; woody. Ovary 3-celled; ovule 1 per cell; style short. Drupe to 30 cm long, ovoid or globose, trigonous; pericarp fibrous; endocarp stony. Seed coherent with the endocarp.</p>	<p>WILD</p> <p><i>Arenga wightii</i></p> <p>Monoecious palms; trunk to 6 m tall, covered with persistent leafsheaths, caudex 10-15 m across. Leaves pinnatisect, to 8 m long; leaflets to 100 x 5 cm. Spadices to 1 m long, basipetal; male flowers orbicular; stamens many, free. Female flowers: tepals 6, biseriate, similar, accrescent; ovary 3-celled. Fruit globose. Drupes numerous.</p>
<p><i>Piper nigrum</i></p> <p>Glabrous climbers. Leaves to 16 x 10 cm, ovate, acuminate at apex, acute, rounded at base, 7-nerved, nervulesubparallel; petiole to 2.5 cm long. Spikes to 12 cm long, slender; peduncles to 2.5 cm long. Flowers closely placed; stamens 2. Drupes 5 mm across, globose, smooth, deep red; stigmas 3-5, recurved. Berries are approximately 40- 50 in each spike.</p>	<p><i>Piper argyrophyllum</i></p> <p>Climbing shrubs. Leaves 8-13 x 5-6 cm, ovate or elliptic, acuminate at apex, acute or rounded at base, oblique, lower side usually covered with white scales, glabrous, basely 7 nerved; petiole 1 cm long; stipule to 1.5 cm long. Spikes slender, leaf-opposed, drooping; peduncle 2-3 cm long; stamens 2. Berry 3 x 3 mm, globose, stigma 4, curved. Berries are approximately 150-200 in each spike.</p>
<p><i>Anacardium occidentale</i></p> <p>Gregarious evergreen trees, to 15 m high, bark pale grey to brown, smooth with vertical striation; exudation sticky, red; branchletsglabrous. Leaves simple, alternate, somewhat crowded on twig apices, exstipulate; petiole 7-15 mm, stout, swollen at base, glabrous; lamina 6-15.5 x 3-8 cm, obovate; base acute, apex obtuse, round, margin entire, glabrous, shiny above; lateral nerves 10-15 pairs, parallel, prominent; Flowers polygamous, yellow, streaked with pink, in terminal; petals 5; stamens 8-10, one usually longer than others. Fruit a reniform nut, 2-3 cm, grey, seated on a large pyriform fleshy body formed of enlarged disc and top of the pedicel; pericarp gives acrid caustic oil.</p>	<p><i>Semecarpus anacardium</i></p> <p>Trees, to 12 m high, bark 5-6 mm thick, grey to greyish-brown, furrows longitudinal and horizontal; blaze dull red; exudation acrid. Leaves simple, alternate, crowded at end of branchlets, exstipulate; petiole 20-45 mm long, stout, pubescent; base acute, apex obtuse, margin entire, glabrous above and lateral nerves 10-20 pairs, parallel, prominent; reticulate, prominent. Flowers polygamous greenish-yellow, in terminal pubescent panicles; petals 5, imbricate; stamens 5 inserted below the disc. Fruit a drupe, 2-5 cm long, fleshy, purplish-black, seated on an orange hypocarp as long as the drupe, pericarp rich in corrosive resinous juice; seed pendulous.</p>

<p><i>Cajanus cajan</i> Shrubs 2- 3 m tall. Leaves alternate, trifoliolate; leaflets elliptic to lanceolate, upper surface glabrate, lower surface usually densely silvery pilose. Flowers in axillary pseudo-racemes, rarely also terminal. Standard petal yellow, 12-17 mm long, often reddish-lined or orange. Stamens diadelphous, anthers uniform. Pods 4-10 x 0.5-1 cm, yellow or green striped with maroon or dark purple, straight to sickle-shaped, pubescent and glandular, weakly septate within; seeds 2-9, cream or reddish brown, slightly laterally flattened, 4-9 x 3-8 mm.</p>	<p><i>Cajanus scarabaeoides</i> Slender twining herbs; stem brown. Leaves 3-foliolate; leaflets obovate or elliptic, basally 3-nerved, reticulations prominent, exstipulate. Flowers racemose or paniculate, pale-yellow, 0.8 cm long in axillary pairs; bracts large, caducous; bracteoles absent. Calyx persistent. Standard petal with two inflexed auricles at base; keel petals slightly incurved. Stamens 9+1. Pods brown tomentose, 2-2.5 cm long, obliquely deeply grooved between seeds; seeds strophiolate.</p>
<p><i>Cucumis sativus</i> Hirsute prostrate herbs; tendrils simple. Leaves 10-16 cm long and broad, broadly orbicular or ovate-cordate, entire or palmately 5-lobed. Male flowers 3-4, in axillary fascicles. Calyx 8-10 mm long. Corolla yellow, 2-3 cm long; lobes acute. Stamens 3; filaments reduced. Fruit oblong, yellowish green. Seeds 8-10 x 3-5 mm, oblong.</p>	<p><i>Cucumis sativus f. hardwickii</i> Slender climbers; tendril simple. Leaves to 12 cm across; entire or shallowly 5-lobed, petiole to 15 cm long. Male flowers in fascicles of 3-5; pedicel to 1 cm long; petals, obovate, yellow. Female flowers solitary, calyx corolla similar to male flower. Berry 3.5 x 2.5 cm, oblong, softly scattered-spinous, greenish-yellow with white stripes; seeds many, compressed.</p>
<p><i>Maranta arundinacea L.</i> Rhizomatous herbs. Leaves 20 x 7.5 cm, oblong-lanceolate, nerves many, closely parallel, obliquely diverging from the midrib; sheath open. Flowers white in pairs, on long, axillary peduncles; bracts prominent, to 1.3 cm. Perianth differentiated in to calyx and corolla; sepals free; corolla tubular, unequally 3-lobed, to 2.3 cm long. Stamen 1; style stout.</p>	<p><i>Schumannianthus virgatus</i> Erect shrubs, to 4 m high; stem thickened at nodes. Leaves ovate-oblong, cuspidate at apex, rounded at base; sheath open. Flowers paired in each bract; sepals small; corolla white, tube short; lobes oblong; stamens 1, outer staminodes petaloid.</p>
<p><i>Oryza sativa</i> Annuals. Culms 50-120 cm high, erect, rooting at the lower nodes; nodes glabrous. Leaves 25-60 x 0.5-1.2 cm, linear-lanceolate or linear, apex acuminate, scabrid; sheaths ciliate along the margins; ligules 2-3 mm long, membranous. Panicles 10-25 cm long, lax. Spikelets 7-10 mm long, oblong, awned or not. Glumes reduced. First lemma 7-10 mm long, oblong-lanceolate, empty. Second lemma 6-8 mm long, lanceolate, granulate, fertile. Palea oblong-lanceolate, acuminate. Grains oblong, tightly enclosed by the lemma and palea.</p>	<p><i>Oryza meyeriana ssp. granulata</i> Perennials; culms 40-90 cm high, loosely tufted or solitary, erect. Leaves 10-25 x 1-2 cm, lanceolate, glabrous; sheath with long hairs at mouth; ligule 1-3 mm long, membranous. Panicle 5-10 cm long scarcely branched; branches angled, smooth. Spikelets few, 5-6 x 2.5 mm; glumes similar, reduced to very minute scales; lemma 5 x 3.5 mm, broadly ovate, granulate crustaceous; palea 5 x 2 mm, oblong, 3-nerved, margins hyaline; anthers 2.5 mm long.</p>
<p><i>Passiflora edulis</i> Climbing shrubs. Leaves to 9.5 x 8.2 cm, palmately 3-lobed, basally 3-nerved, lobes oblong, margin serrulate, apex acute, glabrous; stipules linear. Flowers axillary, solitary, white. Calyx lobes 5. Petals 5, inserted at the throat of calyx tube; corona tinged violet. Stamens 5. Ovary 1-celled; ovules many. Berry about 4 cm across.</p>	<p><i>Passiflora foetida</i> Herbaceous vines. Stem petioles and leaves glandular-hispid. Leaves 5-7 x 3-5 cm, roughly to deeply 3-5-lobed, suborbicular to ovate. Stipules deeply dissected. Bracts and bracteoles persistent, glandular-pubescent. Flowers axillary, often solitary, 3-4 cm across. Calyx lobes 5, 1-1.5 x 0.6- 0.8 cm, broadly ovate, apically spurred. Petals white, shorter than calyx lobes. Coronal segments in 2 whorls; outer coronal hairs many, 0.8-1 cm long; inner ones 2-3 mm long. Gynandrophore 5 mm long. Stamens 5. Berries 1.5- 2 cm diam., subglobose, yellow, subtended by the bracts and bracteoles. Seeds many, 4-5 mm, ovate, laterally compressed and pitted.</p>

<p><i>Momordica charantia</i> Climbers; tendrils simple. Leaves up to 8 x 8 cm, cordate, 5-7-lobed; lobes acute or acuminate, margin dentate. Flowers axillary, solitary. Corolla yellow; to 3 cm across, petals. Stamens 3. Fruit 10-15 cm long, oblong, echinate. Seeds 1-1.5 x 0.7-0.9 cm, ovoid, compressed, base and apex subtridentate, sculptured.</p>	<p><i>Momordica charantia ssp.muricata</i> Annual climber with unbranched glabrous tendrils, monoecious. Stem pubescent to glabrescent. Leaves orbicular. Flowers yellow, 2.5-3.0 cm across, pedicellate. Male flowers solitary; female flowers on 5-15 mm long basally bracteate or ebracteate peduncles. Fruit broadly ovoid, narrowed at ends, 2-7 cm long, 1-2.5 cm broad, orange-red, tuberculate. Seeds elliptic-ovate, 1-1.2 cm long, 6-7 mm broad.</p>
<p><i>Abelmoschus esculentus</i> Erect herbs or under shrubs, green or purplish, covered with stiff simple hairs. Leaves alternate, orbicular, cordate at base, 3-20 x 5-25 cm, palmately 3-7 lobed. Flower axillary, solitary. Corolla yellow with a red or purple centre; petals obovate, rounded at apex, ca 5 x 6 cm, glabrous or sparsely hairy at margin. Capsules cylindrical, 5-angled, acuminate at apex, 10-25 cm long, hairy; seeds globose, glabrous and sometimes pubescent near hilum, dark brown.</p>	<p><i>Abelmoschus moschatus</i> Erect herbs or under shrubs, 1-2 mm tall; stem clothed with long deflexed hairs. Leaves palmately 3 to 7 lobed. Flowers axillary, solitary. Corolla 7-9 cm across, yellow with purple center. Capsules 6-8 cm long, oblong-lanceolate, strongly 5-angular, appressed hairy, blackish when ripe. Seeds c. 3.5 x 3 mm, reniform, concentrically ribbed, blackish.</p>
<p><i>Vigna mungo</i> Climbers with dense pubescence, leaves compound, trifoliolate with pulveinate base. Flowers borne on terminal or axillary, racemose clusters, actinomorphic, bisexual. Calyx 5, fused imbricate. Corolla papilionaceous, ascendingly imbricate, fruits are septicidal legumes.</p>	<p><i>Vigna trilobata</i> Twining, pilose. Leaflets apex obtuse, acute, pilose, basally tri-nerved; petiole 7 cm long, stipule 8 mm, oblong, acute, stipels 3 mm, linear. Racemes axillary, to 15 cm; flowers yellow; bracts 7 mm, corolla 4 mm long; keel 6 x 2 mm, curved, produced to a beak; staminal tube to 4 mm; ovary to 5 mm, pubescent, style curved, bearded at the apex, stigma oblique. Pod terete, puberulus.</p>
<p><i>Amaranthus viridis</i> Herbs stem green or sometimes reddish, glabrous. Leaves alternate, ovate, apex acute, base truncate, nerves 3-6 pairs. Spikes terminal and axillary, interrupted. Flowers unisexual, mixed, densely arranged; bracts and bracteoles similar, ovate, acuminate; tepals 3, 1.5 mm long, obovate, obtuse; stamens 3, free; ovary obovoid, styles 2, free. Achenes 2 x 1 mm, ovoid, acute, membranous; seeds biconvex, dark brown, shining.</p>	<p><i>Amaranthus spinosus</i> Erect glabrous herbs, profusely branched; branches grooved; spines divaricate, sharp, to 1.2 cm long. Leaves 3-8 x 2-4 cm, ovate or elliptic-lanceolate, base attenuate. Flowers in terminal panicle spikes or in axillary, sessile clusters. Bracts and bracteoles minute, ovate-lanceolate. Male flowers: 1-2 mm across; tepals 5, calycine, unequal, ovate-lanceolate; stamens 5; anthers sagittate. Female flowers: 1-2 mm across; tepals 5, oblong, acute at apex; ovary 1-celled; ovules solitary; stigmas 2-3. Utricle circumscissile. Seeds minute, discoid.</p>
<p><i>Pisum sativum</i> Climbing herb with tendrils. Leaves even-pinnate, 25 x 10 cm, glabrous; leaflets 2-3 pairs, rachis produced into a branched tendril; stipules foliaceous, larger than leaflets. Racemes to 10 cm, 2-3-flowered, or flower solitary. Calyx deeply 5-toothed, glabrous; lobes oblong-acuminate, membranous. Corolla white, clawed. Stamens 9 + 1. Pod oblong, 8 x 1.5 cm, glabrous; seeds subglobose.</p>	<p><i>Pueraria phaseoloides</i> Herbaceous vines. Stem slender, 2-4 m. Racemes solitary, 8-15 cm or more. Bracts and bracteoles linear lanceolate. Flowers with short pedicels, clustered at slightly distant nodes. Corolla bluish or lilac; standard suborbicular, 8-12 mm, base with 2 incurved auricles. Legumes subcylindrical. Seeds 15-20, oblong-elliptic, subtruncate at both ends.</p>

Cultivated	Wild
 <p data-bbox="384 734 609 763">Fig.1 Cocos nucifera</p>	 <p data-bbox="1018 734 1236 763">Fig.2 Arenga wightii</p>
 <p data-bbox="395 1265 598 1294">Fig.3 Piper nigrum</p>	 <p data-bbox="986 1258 1268 1288">Fig.4 Piper argyrophyllum</p>
 <p data-bbox="347 1888 657 1917">Fig.5 Anacardium occidentale</p>	 <p data-bbox="976 1888 1284 1917">Fig.6 Semecarpusanacardium</p>

Cultivated	Wild
 <p data-bbox="387 786 603 819">Fig.7 <i>Cajanus cajan</i></p>	 <p data-bbox="979 786 1283 819">Fig.8 <i>Cajanus scarabaeoides</i></p>
 <p data-bbox="379 1352 619 1386">Fig.9 <i>Cucumis sativus</i></p>	 <p data-bbox="938 1352 1321 1386">Fig.10 <i>Cucumis sativus f. hardwickii</i></p>
 <p data-bbox="331 1906 671 1939">Fig.11 <i>Maranta arundinaceae L.</i></p>	 <p data-bbox="948 1906 1310 1939">Fig.12 <i>Schumannianthus virgatus</i></p>

Cultivated	Wild
 <p>Fig.13 <i>Oryza stiva</i></p>	 <p>Fig.14 <i>Oryza meyeriana</i> ssp. <i>Granulate</i></p>
 <p>Fig.15 <i>Passiflora edulis</i></p>	 <p>Fig.16 <i>Passiflora foetida</i></p>
 <p>Fig.17 <i>Momordica charantia</i></p>	 <p>Fig.18 <i>Momordica charantia</i> ssp. <i>muricata</i></p>

Cultivated	Wild
 <p data-bbox="331 779 657 813">Fig.19 <i>Abelmoschus esculentus</i></p>	 <p data-bbox="975 779 1300 813">Fig.20 <i>Abelmoschus moschatus</i></p>
 <p data-bbox="386 1341 603 1375">Fig.21 <i>Vigna mungo</i></p>	 <p data-bbox="1023 1341 1252 1375">Fig.22 <i>Vigna trilobata</i></p>
 <p data-bbox="354 1906 635 1939">Fig.23 <i>Amaranthus viridis</i></p>	 <p data-bbox="986 1906 1295 1939">Fig.24 <i>Amaranthus spinosus</i></p>

Cultivated	Wild
 <p style="text-align: center;">Fig.25 Pisum sativum</p>	 <p style="text-align: center;">Fig.26 Pueraria phaseoloides</p>

4. CONCLUSION

Because of environmental peculiarities of the study area, represents a great diversity of profitable edible cultivated and wild species, which represent genetic resource of great value. The native and introduced plants, together with the enhancing effect on ethnobotanical knowledge, have resulted in the accumulation of a great quantity of information that has remained unknown to the rest of the world. We hope that this report will increase interest in the importance of safeguarding the local resources and associated ethnobotanical knowledge from Palakkad. The ethnobotanical research should be extended to other areas in order to preserve the traditional knowledge related to plants. It also available to future generations as well, showing the way for authenticity, simplicity and revival of that which is genuine. There is an obvious need to explore wild plants of sustainable utilization of genetic resources that will also add new aspects towards plant breeding programmes. Conservation of wild plants would develop the wealth of the forest and thereby the nation.

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