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A Review on Peach (Prunus persica): An Asset of Medicinal Phytochemicals

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Abstract: Peach has many anti-disease properties such as anticancer, anti-allergic, antitumor, antibacterial, antimicrobial, anti-inflammatory. Beside this , it has high nutritive value so important for Human nutrition. It is a fast growing evergreen tree which is found in India, Spain and China. This review gives a sharp view onits origin, morphology, biological activity, medicinal uses and its different application for the wellness of mankind.
Keywords: Peach, Prunus persica, Medicinal plant, Antioxidant property, Phytochemical

I. INTRODUCTION

The Rosaceae is the 19th largest family of plant[1]-[3]. A group of closely related genera is known as family. The genus Rosa is made up of closely related species of Rose. The scientific name of a family ends in case. So Rose family is known as Rosaceae [4].Michael Adanson was first who published this name "Rosaceae**"** (Table I) but Antoine Laurent de Jussieu has been accepted by The International Code of Botanical Nomenclature (ICBN) (2006) as the author for this name**.** For defining multiple characteristics groups, Jussieu incorporated the Linnaean concept of binominal nomenclature with Adanson's methodology so the ICBN preserved Jussieu's names for 76 plant families. Currently, phylogenetic approaches based on analysis by the angiosperm phylogeny group (APG I, 1998; APG II, 2003) are resolving controversies and deficiencies in angiosperm classifications [2].The Rose family includes some large genera like Prunus (peach), Pyrus (apple) etc. [4]. It is a large family [5] of about 90-125 genera (Table II) and 3370-3500 species[1], [6]-[8] of trees, shrubs and herbs[10]. That are rhizomatous, thorny, or climbing[1], [3] of worldwide distribution[9]. Its utmost growth is shown in north temperate regions[8]-[11],or northern hemisphere[1].Rose family distribution is cosmopolitan [1] to sub-cosmopolitan, however it has varied distribution [2].Extraordinary phenotypic diversity, plant habit, chromosome number, and fruit type has been shown by members of the family after the fast growth of Rosaceae[7], [8], [11]. The plants of this family are mainly grown for their beauty and fragrance[3], [12].The Rosaceae are very well represented with immense economic and scientific value[8].The herbaceous species cultivate in temperate forests as understory plants, in salt or freshwater marshes, in arctic tundra, in old fields, and along roadsides[2]. Woody members are prime species, and are well-known in the early stages of forest succession. In mature mixed deciduous forests, rosaceous trees are found in lesser part of it[2].

Table I
Classification of family rosaceae

Kingdom	Plantae
Sub-kingdom	Tracheobionta
Super division	Spermatophyte
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidea
Order	Rosales
Family	Rosaceae

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Table II
International code of botanical nomenclature (icbn) accepted genus names within rosaceae[2], [4]

Acaena Mutis ex L.	Ivesia Torr. & A. Gray
Adenostoma Hook. & Arn.	Kageneckia Ruiz & Pav.
Agrimonia L.	Kelseya (S. Watson) Rydb.
Alchemilla L.	Kerria DC.
Amelanchier Medik.	Leucosidea Eckl. & Zeyh.
Aphanes L.,	Lindleya Kunth, nom. cons.
Aremonia Neck. Ex Nestl., nom. cons.	Luetkea Bong.
Aria (Pers.) Host, Aronia Medik., nom. cons.	Neviusia A. Gray
Aruncus L.	Oemleria Rchb.
Bencomia Webb & Berthel.	Orthurus Juz.
Brachycaulos R. D. Dixit & Panigrahi	Osteomeles Lindl.
Cercocarpus Kunth	Pentactina Nakai
Chaenomeles Lindl., nom. cons.	Peraphyllum Nutt. 60
Chamaebatia Benth.	Petrophytum (Nutt. ex Torr. & A. Gray) Rydb.
Chamaebatiaria (Porter ex W. H. Brewer & S. Watson) Maxim.	Photinia Lindl.
Chamaemeles Lindl.	Physocarpus (Cambess.) Raf., nom. cons.
Chamaemespilus Medik.	Polylepis Ruiz & Pav.
Chamaerhodos Bunge	Potaninia Maxim.
Cliffortia L.	Potentilla L.
Coleogyne Torr.	Prinsepia Royle
Coluria R. Br.	Prunus L.
Cormus Spach	Pseudocydonia (C. K. Schneid.) C.K.Schneid.
Cotoneaster Medik.	Purshia DC. Ex Poir. 70
Cowania D. Don	Pyracantha M. Roem.
Crataegus L.	Pyrus L.
Cydonia Mill.	Quillaja Molina
Dalibarda L.	Rhaphiolepis Lindl., nom. cons.
Dichotomanthes Kurz	Rhodotypos Siebold & Zucc.
Docynia Decne.	Rosa L., nom. cons. prop.
Docyniopsis (C. K. Schneid.) Koidz.	Rubus L., nom. cons. prop.
Dryas L. Prunus L.	Sanguisorba L.
Duchesnea Sm.	Sarcopoterium Spach
Eriobotrya Lindl.	Sibbaldia L.
Eriolobus (DC.) M. Roem.	Sibiraea Maxim.
Exochorda Lindl.	Sieversia Willd.
Fallugia Endl.	Sorbaria (Ser. ex DC.) A. Braun, nom. cons.
Filipendula Mill.	Sorbus L.
Fragaria L.	Spenceria Trimen
Geum L.	Spiraea L.
Gillenia Moench	Spiraeanthus (Fisch. & C. A. Mey.) Maxim.

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Guamatela Donn. Sm.	Stephanandra Siebold & Zucc.
Hagenia J. F. Gmel.	Taihangia T. T. Yu & C. L. Li
Hesperomeles Lindl.	Tetraglochin Poepp.
Heteromeles M. Roem.	Torminalis Medik.,
Holodiscus (K. Koch) Maxim., nom. cons.	Vauquelinia Corrˆea ex Bonpl.
Horkelia Cham. & Schltdl.	Waldsteinia Willd.
Horkeliella (Rydb.) Rydb.	Xerospiraea Henr.

Rosaceae is further classified into four subfamilies such as Amygyloideae (Table III), Maloideae, Rosoideae and Spiraeoideae[2], [8]. Subfamily Amygdyloideae includes genus Prunus (Table II) [2]. Species of Prunus, fruits stone is the most important nut worldwide[2]. The stone fruits are soft at maturity. In general, they are less hardy in comparison to pome fruits. They can be eaten fresh because they have very short storage life comparatively. They are tasty and their flavors are outstanding so they are much preferred. They can also be consumed dried like plum and apricot[2], [59]. Prunus, genus that have their origin in the Asian continent[15].The word '*Prunus*' might have been taken from Greek '*Prounos* or *Proumnos*'[19].

A. Prunus Persica (Peach and Nectarine)(Table IV): Morphology and Geographical distribution

It belongs to the family Rosaceae and the subfamily Amygdyloideae [16]**.** It is commonly known as "Aaru" and in English popularly called "Peach" has been extensively consumed worldwide.Peach has an important place in human nutrition, and can be used as fresh, dried or processed fruit.Peaches (*Prunus persica* (L.) Batsch) are nutritionally and economically essential and they are one of the most popular fruits consumed worldwide [21], [47]. Different phenolic compounds have been recognized in peach fruits [29], [55]

Table III
Some economically important species of subfamily amygyloideae[(2)].

Subfamily	Genus	Species	Common name	Uses
Amygyloideae	Prunus	armeniaca	Apricot	Fresh and processed fruit
		avium	Sweet cherry	Fresh and processed fruit
		cerasus	Tart (sour) cherry	Fresh and processed fruit
		domestica	European plum	Fresh and processed fruit
		dulcis	Almond	Fresh and processed fruit
		mume	Mume	Ornamental
		persica	Peach, nectarine	Fresh and processed fruit
		Serotina	Black cherry	Timber species

It is deciduous tree up to 10m in height[16] or evergreen trees and shrubs naturally distributed throughout temperate regions, originally from Asia or Southern Europe[16], [22].Generally, its bark is grayish or ashy acuminate glabrous[16], [18]. Useful action of its bark is expectorant (used in cough, whooping cough, and chronic bronchitis), sedative, stomachic, demulcent, anti-scorbutic, diuretic[16]. Wide variety of fruit and flesh color yellow to red and shape is its uniqueness[2]. Melting and rubbery are two types of flesh texture of its [57]. They are also consumed as well as processed into juices and sliced or dried product[2]. Its flowers are pinkish- white sessile, short and pedicelled. Green colour leaves are very useful as astringent, demulcent, diuretic, expectorant, febrifuge, laxative, and parasiticide and are seductive[13], [18].Fresh leaves are anthelmintic and powder of its leaves styptic (externally) [60].The fruit of these species is botanically known as a drupe [23] and have stomachic, antiscorbutic action biologically [60]. The fruits usually have a clear ventral suture, do not retain floral residues next to the pedicel, and are characterized by a membranous exocarp, [8] with an outer fleshy mesocarp[58] consisting mainly of parenchyma cells [24]. The mesocarp surrounds a shell (the pit or stone) of hardened endocarp with a seed inside and due to this,Prunusspecies are also referred to as "stone fruit". In almonds, the consumed portion is the seed within the pit, while the edible part in most stone fruits includes the mesocarp, and eventually the exocarp[14].Like other stonefruit, peaches and nectarines, both closely related [23] have a characteristic, lignified endocarp (pit or stone) that encloses the seed, a fleshymesocarp and a thin exocarp[14]**.** In initial stage after

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fertilization characterized by active cell division, a double sigmoid pattern can be seen while growing of this fruit, followed by a phase in which all the parts of the ovary besides the embryo and endosperm grow[22]. Later on, whole fruit growth is decelerated, while seed development and endocarp lignification occur and lastly mesocarp development resumes [8], [22], [24]Their distinctive aesthetic and organoleptic characteristics make these fruits highly valued. FreshPrunusspecies are major contributors of bioactive compounds to the diet during spring and summer, although the increase in year round supply in the developed world has lessened these seasonal eating habits[22].

Table IV
Taxonomic classification of prunus persica

Kingdom	Plantae
Sub kingdom	Tracheobionta
Super division	Spermatophyta
Division	Magnoliophyta
Class	Megnoliopsida
Subclass	Rosidae
Order	Rosales
Family	Rosaceae
Subfamily	Amygyloideae (*Prunoideae*.)
Genus	*Prunus*
Species	*Prunus Persica*

English -Peach tree.
Ayurvedic-Aaruka.
Unani -Aaaduu, Khokh [60]
Most Prunus fruits and seeds are commonly used for processing [59]. Including jam production, canning, drying or roasting and are regularly consumed year round. Among stone fruits peach contribution of phenolics to the diet is highest [26]. These fruits with low, medium or high acid concentrations are also available [14], [23]. In spite of these general features, both the qualitative and quantitative profiles of these compounds vary markedly depending on the variety [22], [25], [27]-[31]. Peach fruit is rich in ascorbic acid (vitamin C),carotenoids (provitamin A), and phenolic compoundsthat are good sources of antioxidants [14], [28], [29], [32].

B. Cultivation of Prunus persica

Prunus persica is commonly cultivated in West Asia, Europe, Himalayas and India up to an altitude of 1000 ft. [1], [20]. *Prunus* has nearly 200 species cultivated for their edible fruits and seeds [20], [37]. In Mediterranean countries with Murcia region it is extensively cultivated [63]. The first introduction of peaches in India can be traced during the reign of King Kanishka by Chinese hostages in 1st century AD. Dring late 19th century many varieties of peaches and plums along with other temperate fruits have been introduced in Himachal Pradesh by Mr. A. N. Lee, son of Captain R. C. Lee [22], [46], [60].It is very well represented in North-West China [8], [17] which is native place of it[2]. It was first domesticated and cultivated in the region between the Terrin basin and the north slopes of the Kunlun shah Mountain [17]. China is the centre of origin for peach and was domesticated there 4-5000 years ago [21], [38], [42], [43]. China is also place of origin for Chinese wild peach (P. consociiflora Schneid.). Flat peaches (P. persica var. platycarpa) also originated in China [22], [41], [57]. It is cultivated in subtropics. Its production is increased day by day [2]Commonly cultivate for edible fruits from sub-Himalayan region up to 2400 m.[18], [34], [35]. Chinese literature dates cultivation of the peach in China to 1000 b.c. and it was probably carried from China [36] to west were sea through India and mid-east as well as silk route to Persia[36], [41]. Peach, at one time called “Persian apple”, [36] further, it is believed that early Greek and Roman writers gave the ‘Peach’ nomenclature [22] quickly spread from there to Europe. It is believed that nectarines might have originated in Europe, which was introduced to China. However, it is also considered that nectarines are also native to China

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[22], [41] In the 16th century, it was established in Mexico and in the 18th century Spanish missionaries introduced the peach to California, which turned out to be the most important production area after China and Italy [14], [36]. The main world producing countries of stone fruit include China, USA, Italy, Spain and Turkey [22].The most popular fruits within this group are by far peaches/nectarines and plums with an annual production around 17.5 and 9.7 million tons in 2007 [22]. As the largest producer of peach fruits in the world, China (11.9 million metric tons, 2013 FAO data) currently has approximately more than 1000 peach cultivars [56]. However, no extensive investigation of the phenolic profile and nutritional value of Chinese peach cultivars has yet been carried out [21]. In China, Cultivars Harflame, Nectared 1, Fantasia, Arctic Snow, Summer Fire, Arctic Star, Sunglo, Mayfire, and Flavortop are some popular nectarine cultivars. Cultivars Olimpia, Orex Mex, Flordagem, Flordaglo, Newbelle, Tropic Prince etc. are some popular low chill peach cultivars. Peento peach cultivars are China Flat, Sweet Bagel, Galaxy, Sauzee Queen, Saturn, UFO and Ruipan No. 1 etc [22].Spain is the leading peach producer. its annual production is of 162000 tonnes from the cultivation area of 11151 hec. In 2010 [63]. 21% and 25% of the peach production and cultivation area is represented by these figures. It is the second large producer in European Union (29% total production) and fourth producer in the world [64] Catalonia and Aragon is the most important area for producing peaches in Spain [65]. While Ebro velly are frequently showed to severe spring frost during the blooming and fruit set periods (March and April to the end of October). 33% of total fruit production in the spain is provided by the main deciduous fruit crop species[66]. In China,there are more than 3000 peach cultivars in the world today, which can be variously classified as melting and non-melting flesh, or hairy and smooth skin, or clingstone and freestone, *etc*. [21], [47]. In North China provinces the Mitao cultivars are generally cultivated, whereas, Shumitao peaches (Honey peach), are commonly grown in Southern parts of China[22]. Three groups of peaches are recognized in China, southern group is found in provinces along the Yangtze River, northern group is grown in the provinces along the Yellow river and third group is grown in arid North West China [44]. In India, Peach cultivars J. H. Hale, Early Hale, Halbarta, Candoka, June Elbarta and Hale Haven with Hale in their parentage show self-sterility (male sterile) and require pollinizers for fruit set. Peach varieties are grouped on the basis of flesh colour (yellow and white), melting nature of flesh (melting and non-melting), stone adhesion to flesh (free stone, semi cling stone and cling stone) and chilling requirement[43]. In India, Gene bank of NBPGR, Regional Station, Shimla (India), has about 22 indigenous and 27 exotic accessions [45]. Namely: Summer Glo, NemaGuard, Candor, Stark Early Glo, Flordaball, Flordasun, Sunred, Dixi Red, C. O. Smith, Snow Queen, Peach S-37, July Elberta, Fire Prince, Duke, Alton Peach, Ambri, Okubo, Kanto 5, Nishiki, Luna etc. Recommended cultivars in India [39], [40] are Shan-i-Punjab, July Elberta, J. H. Hale, Crawford's Early (locally selected as Paradelux), Red June (Elberta selection), Shaharanpur Prabhat and Flordasun[22]. Such a huge range of cultivars provides important genetic resources for the evaluation of the phenolic profile. So far, phenolic compounds have been characterized in peach germplasms grown in different regions, such as USA [48]-[50], Italy [51], Spain [52], [53], Brazil [54] and Pakistan [55]. As a result, in southern China, melting peaches are famous for their soft texture, juicy flesh, good flavour and sweet taste, which make them quite competitive in the fresh fruit market [21].

C. Volatile in Nature

Peaches are members of the genus Prunus that includesapricots, plums, cherries, almonds, and nectarines. Peaches and nectarines differ primarily in that nectarines have a smooth skin whereas peaches possess a downy skin, but both may be freestone – the pit is relatively free of the flesh – or clingstone – the pit follows to the flesh. In this final case, peaches and nectarines are drupes or ''stone fruits'' – like apricots, plums, cherries, and mangoes – in which an outer fleshy part (exocarp and mesocarp) surrounds a hard stone (endocarp) with a seed inside Peach and nectarine volatiles have been intensively investigated, and more than 100 compounds have been identified [67]-[88].

A wide range of pre- and postharvest conditions can alter the synthesis and emanation of volatiles from harvested plant products [89] that may be associated with flavor, ripening and other factors impacting quality or storage potential.The volatile composition of peach has been thoroughly studied leading to identification of more than one hundred volatile compound. The most abundant compound is c_6 compound, linalool, benzaldehyde, ester terpinoids, c_{13}norisoprenoids, ketones and lactones [90], [91]. The flowering properties derive from lactones and particularly γ & δ-decalactones, with smaller contributions from C_6 aldehydes, alcohols, terpinoids [92], [93], [94]. The chemical composition of the volatile compound varies in the different part of the fruit. In the pulp volatile compound such as C_6 compound, C_{13} norisoprenoids and benzaldehydes are more concentrated then in the inner mesocarp[95]. Beside the composition evolves during the ripening process: C_6 compound levels decrease drastically, whilst the content of lactones, benzaldehyde, linalool, norisoprenoids and phenylalanine derivates increase [96]-[99]. The volatile composition is also affected by the storage condition of the fruit [100], [101].

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II. APPLICATION OF PRUNUS *PERSICA*

A. Chemical compound in prunus persica

1) Khalil Zaghdoudi et al., examined Accelerated solvent extraction of carotenoids from: Tunisian Kaki (Diospyros kaki L.), peach (Prunus persica L.) and apricot (Prunus armeniaca L.). these carotenoids present in prunus persica moisture content of fruits (skin + flesh), expressed as g of water per 100 g of fresh weight, were found to be 77.66 ± 1.63%, 85.85 ± 2.79% and 87.00 ± 5.08% for kaki (D. kaki), peach (P. persica) and apricot (P. armeniaca), respectively. The significantly lower water content of kaki as compared to peach and apricot is in accordance with data from the[102], which indicates that this lower water content is balanced by a higher carbohydrate content of about 23 g/g of fresh product in kaki against only about 10 g/g of fresh product in peach and apricot[103]

2) Aslihan Kazanet al., examined Supercritical fluid extraction of Prunus persica leaves and utilization possibilities as a source of phenolic compounds. The extraction process was optimized using the total phenol content as a response. The results of radical scavenging activity (RSA) analyses were not included in the optimization step. Second-order polynomial equations were used to express the total phenol content[104].

3) Mustafa Serhat Ekinci et al., examined Extraction of oil and β-sitosterol from peach (Prunus persica) seeds using supercritical carbon dioxide. The seeds were separated from their shells by a crusher. Unshelled peach seeds were ground into small pieces using a plant grinder. Then the ground unshelled seeds were classified into different sizes: 0.3 mm, 0.7 mm, 1.2 mm and 1.7 mm[105].

4) Rongling Yanget al., Convenient synthesis of alkyl and phenyl alkyl _-d glucopyranosides using facile and novel biocatalysts of plant origin. To find new and efficient catalysts for the synthesis of various alkyl glycosides, many fruit and vegetable seeds were tested as the potential sources of -glucosidase[106].

5) R. Raturi et al., examined Chemical Constituents of Prunus persica Stem Bark. It was isolated as yellow crystals from methanol[107].

The APCIMS spectrum of compound 1 showed molecular weight of 446 amu, which corresponds to the molecular formula $C_{22}H_{22}O_{10}$. It gave positive test with FeCl3, Mg/HCl and Molish test thereby showed it to be a flavonoid glycoside. The UV spectrum of the compound showed absorption band at 270, 276, 428 nm and IR absorption band appeared at 3410, 1650, 1525, 1430 cm-1 which were characteristic for flavonoid glycoside.

The 1H NMR spectrum of compound 1 displayed a typical signal of flavonoid, the presence of two doublets at δ 6.89 and δ 6.66 with coupling constant 7.0 and 5.5 Hz were assigned for H-3 and H-5'. The three singlet at δ 7.3, δ 7.7 and δ 6.95 were characteristic for unsubstituted H-2', H-8, H-5. A sharp singlet at δ 3.09 was assigned for aromatic methoxyl position at C-6, other singlet at δ 1.27 was assigned for rhamnose methyl group. The position of anomeric proton at δ 5.95 (s, 1H) indicated the α configuration of the rhamnose sugar. The 13C NMR spectrum of the compound 1 displayed twenty-two carbons, peak at 168.0 was assigned for carbonyl carbon atom whereas the peaks at 149.0, 129.5, 134.1 and 110.1 were assigned for oxygenated substitution at C-6, C-4', C-3' and C-7 positions. The down field value of 110.1 of C-7 showed glycosidation at this point. The up field signal at 17.5 assigned for rhamnose methyl, whereas signal at 54.3 was depicted for methoxy function. On the basis 772 Chemical Constituents Short Communication, it was crystallized from methanol as crystalline solid. Molecular ion peak was observed at m/z 445[M] + and the other fragment peaks were obtained at m/z 469[M+H+Na] +, 490[M-H+2Na] +, 272. The peak at m/z 282[M-H-162] + arose by loss of one hexose unit from molecular ion peak.

The UV spectrum of the compound 2 showed a prominent maximum at 259 indicating isoflavonoid nucleus which was supported by a 13C chemical shift of 148.3 for a methylene carbon which corresponds to C-2 of an isoflavone and excluded the isomeric flavone structure [16]. Moreover, the H-2 chemical shift value of δ 8.15 indicated its isoflavone nature. The glycosidic nature of the compound 2 and its sugar moiety was proved by hydrolysis followed by paper chromatography. The aglycon was identified as prunetin and sugar as glucose. The presence of a distinct bathochromic shift R. Raturi et al. of above spectral data the compound was identified as flavon 3', 4', dihydroxy 6 methoxy 7-O-α -L-rhamnopyranoside. The 1H-NMR and 13C-NMR, data of compound 1 are given in Table I.

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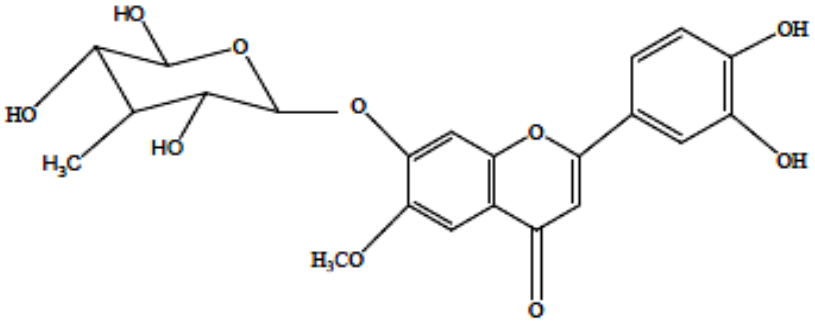


Fig. 1. Structure of compound 1: flavon 3', 4', dihydroxy 6 methoxy 7-O-α -L-rhamnopyranoside.

Compound 2 (12nm) on addition of AlCl3-HCl to its aglycone and its absence in the UV spectrum of the respective glycoside indicated that the sugar was attached to C-5 OH. The 1H and 13C chemical shift as well as 1H-1H coupling constant confirmed that the sugar was glucose and it has β configuration (J≈6.0Hz). The sides of the linkage of the two substituents Me and β-D-glucosyl were ascertained by two NOE difference experiments on irradiation of the anomeric proton (H-1"). δ 5.05 signal enhancement were observed for one aromatic proton only (H-6) proving that the sugar is attached to that C-5 OH. The appearance of C-3"/5" responses provided a further argument of glucosyl grouping. The downfield signal at 168.1 (C-4) in its 13C NMR spectrum of compound 2 suggested the presence of carbonyl functional group whereas the anomeric carbon 106.3 (C-1") and methoxyl 54.5 (OMe) were resonated in its 13C NMR spectrum which confirmed the presence of β linked sugar and methoxyl group at C-5 and C-7 positions of the compound. Irridiation of methoxy proton however induced NOE of both the H-6 and H-8 signals. Thus this substituent is positioned between them i.e. at C-7 OH, the NOE on H-6 is clearly smaller than that on H-8 therefore the methyl group is directed preferably towards the H-8 atom due to its steric interfere with the bulky sugar moiety. Thus on the basis of above studies compound 2 was identified as prunetin-5-O-β-D-glucopyranoside

Enaam Y. Backheet et al., examinedflavonoids and cyanogenic glycosides from the leaves and stem bark of prunus *persica* (meet ghamr) peach local cultivar in assist region[108].

The concentrated extract (350 g) was diluted with distilled water and subjected to solvent fractionation using *n*hexane (6´500 ml), chloroform (5´500 ml), ethyl acetate (6´500 ml) and *n*butanol (5´500 57 ml). The obtained fractions were separately concentrated under reduced pressure till solvent-free residue (200, 40, 50 and 30 g, respectively) and examined for different constituents by silica gel TLC using systems I and III.

B. Leaves

The air-dried powdered leaves (3.8 kg) ofPrunus persica(L.) Batsch “Meet Ghamr” peach were exhaustively extracted with methanol at room temperature and concentrated under vacuum.

C. Ethyl Acetate Fraction

About 15 g of the ethyl acetate soluble fraction was chromatographed on silica gel column (450 g, 5´150 cm), and eluted with chloroform followed by chloroform-methanol gradient. Fractions of 250 ml were collected, concentrated and monitored by silica gel TLC using systems I & III. Five fractions were obtained; fraction I (1 g, eluted with chloroform), fraction II (5 g, eluted with chloroform-methanol 95:5), fraction III (4 g, eluted with chloroform-methanol 90:10), fraction IV (3.5 g, eluted with chloroform methanol 85:15) and fraction V (1.3 g, eluted with chloroform methanol 80:20). About 3 g of fraction II was rechromatographed on ODS column (300 g, 5´120 cm) and eluted with water-methanol (30:10) to obtain compound **1** (500 mg). Fraction III was rechromatographed on ODS column (300 g, 5´120 cm), eluted with water-methanol (30:10) and (20:10) to yield compound **2** (300 mg) and compound **3** (200 mg). Fraction IV was rechromatographed on silica gel column (100 g, 2´75 cm) and eluted with chloroform-methanol (90:10) to afford compound **4** (200 mg).

D. N-Butanol Fraction

About 10 g of the *n*-butanol soluble fraction was fractionated on silica gel column (300 g, 5´120 cm). Elution was started with ethyl acetate followed by ethyl acetate methanol gradient. Fractions of 200 ml were collected, concentrated and monitored by silica gel TLC using systems I & III. Four fractions were obtained; fraction I (1 g, eluted with ethyl acetate), fraction II (3 g, eluted with ethyl

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acetate-methanol 95:5), fraction III (2 g, eluted with ethyl acetate-methanol 90:10) and fraction IV (3.8 g, eluted with ethyl acetate-methanol 80:20). Fraction II was rechromatographed on sephadex LH-20 using methanol. Further purification by preparative TLC using chloroform-methanol (80:20) afforded compound **5** (500 mg). Fraction III was rechromatographed on ODS column (300 g, 5´120 cm) using water-methanol (10:20) to yield compound **6** (50 mg). Fraction IV was purified on ODS column (300 g, 5´120 cm) using water-methanol (30:10) to obtain compound **7** (40 mg).

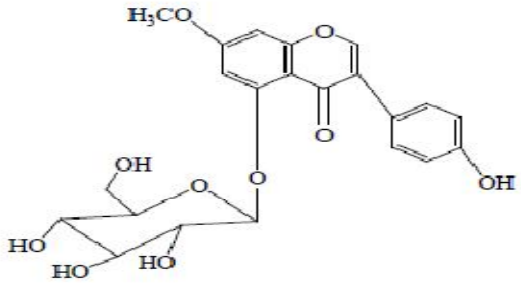


Fig. 2. Structure of compound 2: prunetin-5-O-β-D-glucopyranoside[107].

E. Stem Bark

The air-dried ground stems bark (1.1 kg) of Prunus persica(L.) Batsch "Meet Ghamr" peach was extracted with methanol at room temperature. The methanolic extract was concentrated under vacuum until solvent-free residue (100 g). The residue was diluted with distilled water and fractionated by using *n*-hexane (3´500 ml), chloroform (3´500 ml), ethyl acetate (5´500 ml) and *n*-butanol (4´500 ml). Each fraction was concentrated under reduced pressure to give the corresponding solubles (15, 10, 50 and 15 g, respectively) and screened by silica gel TLC using system I.

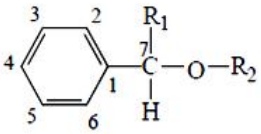
F. Chloroform Fraction

The chloroform soluble fraction (10g)was chromatographed on silica gel column(300 g, 5´120 cm) and elution was performedwith *n*-hexane-acetone gradient. Fractions of150 ml were collected, concentrated andscreened by silica gel TLC using system I.Three fractions were obtained; fraction I (2 g,eluted with *n*-hexane-acetone 90:10), fraction II(4.8 g, eluted with *n*-hexane-acetone 80:20) andfraction III (3 g, eluted with *n*-hexane-acetone70:30). Fraction II was purified by repeatedcrystallization from methanol to obtaincompound **8** (500 mg). Fraction III wasrechromatographed on silica gel column (90g,2´75 cm) and eluted with *n*-hexane-acetone (80:20) to yield compound **9** (500 mg).

G. Ethyl Acetate Fraction

About 15 g of the ethyl acetate soluble fraction was fractionated on silica gel column (450 g, 5´150 cm). Elution was started with chloroform followed by chloroform-methanol gradient. Fractions of 300 ml were collected, concentrated under reduced pressure and monitored by silica gel TLC using system I. Similar fractions were combined to give five fractions; fraction I (800 mg, eluted with chloroform), fraction II (3 g, eluted with chloroform-methanol 95:5), fraction III (3.2 g, eluted with chloroform-methanol 90:10), fraction IV (4 g, eluted with chloroformEnaam Y. Backheet, et al. 58 methanol 85:15) and fraction V (3.8 g, eluted with chloroform-methanol 80:20). About 2 g of each of fraction II and III was rechromatographed on ODS column (300 g, 5´120 cm) using water-methanol (1:1) to afford pure compounds 10 (70 mg) and 11 (100 mg), respectively. Each of fraction IV and V was purified by repeated crystallization from methanol to yield compound 12 (300 mg) and compound 13 (200 mg), respectively.The molecular formula for Compound1- Was deduced as C14H17O6N from FAB-MS, m/z296 [M+1] +. Its 1H-NMR spectrum showedsignals at d 7.48 and 7.57, representing atypical pattern for monosubstituted benzene ring and a sharp singlet signal at d 6.03assigned for an oxygen bearing methine proton.Compound5 The FAB-MS of compound 5 showed [M+1]+ at m/z 314 was consistent with the molecular formula C14H19O7N.compound 5 was identified as mandelic acid amide-b-Dglucopyranoside which was isolated for the first time from the genus Prunus. This compound can be considerd as the product of hydration of nitrile group of prunasin.19 The UV spectral data in methanol for compounds 2-4 indicated their nature as C-3 OH substituted flavonols.22 They were identified as kaempferol-3-O-b-Dgalactopyranoside (trifolin), kaempferol-3-O-b- D-glucopyranoside (astragalin), and quercetin- 3-O-b-D-glucopyranoside by direct comparison of their spectral data with literature data3,22-24. Acid hydrolysis followed by co- TLC for each of the aglycone and sugar part with authentic samples confirmed their structures. Enaam Y. Backheet, et al.

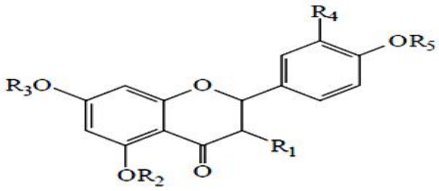
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For compound: 1, 5, 7



For compound 2, 3, 4, 6



For compound 8, 9, 10, 11, 12, 13

Table V Showing Compounds

Compound	R_1	R_2	R_3	R_4	R_5
1	CN	Glucose			
2	Galactose	H			
3	Glucose	H			
4	Glucose	OH			
5	$CONH_2$	Glucose			
6	Galactose-glucose	H			
7	CN	Glucose-glucose			
8	H	H	CH_3	OH	CH_3
9	H	H	H	H	H
10	OH	H	H	H	H
11	H	H	H	OH	H
12	H	H	CH_3	O-glucose	CH_3
13	H	Glucose	H	OH	CH_3

Compound6showed [M+1] + peak at m/z 611 consistent with the molecular formula C27H30O16. The UV spectral data in methanol indicating its C-3 OH substituted flavonol nature.22 Study of the effects of ionizing and complexing agents indicated the presence of free hydroxyl groups at C-5, C-7 and C-4¢. showed signals in the aromatic region at d 6.28 and 6.50 (each 1H, d, J= 1.83 Hz) for H-6 and H-8, respectively, another two doubleCompound**7** were very similar to those of compound **1** with an additional b-glucopyranosyl moiety. This was confirmed bythe existence of two anomeric signals at d 4.42(d, J= 7.80 Hz, H-1¢), d 103.68 (d, C-1¢), d 4.26(d, J= 7.80 Hz, H-1²) and d 101.58 (d, C-1²),indicating its bioside nature.17 The downfieldshift of C-6¢ at d 68.47 indicated theinterglycosidic linkage to be (1²®6¢).17 Theidentity of the two sugars and their sequencewere assigned by the 1H-1H COSY, HSQC andHMBC spectra. Compound **7** was concluded to be mandelonitrile-b-D-glucopyranosyl-(1®6)-b-D-glucopyranoside (amygdalin) by comparison of its 1H- and 13C-NMR spectral data with those reported.18,20 Prunasin and amygdalin were reported from the leaves of Prunus serotina and Prunus virginiana21 and this is the first report for their occurrence in the leaves of the title plant.Compound 8was found to have themolecular formula C17H16O6 as deduced fromFAB-MS, *m/z* at 317 [M+1] +. The UV data andthe study of the effect of ionizing and compound8was identified as 5,3¢-dihydroxy-7,4¢-dimethoxy flavanone (persicogenin).

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Compounds 9-11 were identified asnaringenin, dihydrokaempferol (aromadendrin)and eriodictyol, respectively by comparison oftheir spectral properties with literature data.22-25.The molecular formula of compound 12was deduced as C23H26O11 from its FAB-MS,m/z at 479 [M+1] +. Its 1H- and 13C-NMRspectral data compound 12could be identified as persicogenin 3¢-O-b-Dglucopyranoside.FAB-MS of compound 13 showed $[M+1]^+$peak at m/z 465 consistent with the molecularformula C22H24O11. Compound13 was identified ashesperitin 5-O-b-D-glucopyranoside.In the course of the present work, it wasobserved that the flavonoids isolated from theleaves belong entirely to flavonols, while thoseisolated from the stem bark belong toflavanones and dihydroflavonols [109].

H. Biological Activity

Peach (prunus *persica*) shows many biological activities. Some biological activities are mentioned below: -

I. Antidiabetic Activity

1) P. Hephzibah christabel et al., observed enzyme inhibitors from *prunus persica* Batsch:An alternate approach to treat diabetes[109].
2) Usharani chatragadda et al., studied pharmacological evaluation on glucose lowering efficay of leave of prunus *persica*[110]..

J. Antioxidant Activity

1) Feten Belhadj et al., examined bioactive compounds contents, antioxidant activitiesn during ripening of Prunus persica L. varieties from the North West of Tunisia[111].
2) Abderrahmane Mokrani, et al., inspected Effect of solvent, time and temperature on the extraction of phenolic compounds and antioxidant capacity of peach (Prunus persica L.) fruit[112].
3) Naveen Dhingra, Rajesh Sharma, Anand Kar., observed Towards further understanding on the antioxidative activities of Prunus persica fruit: A comparative study with four different fractions[113].
4) Marina Carbonaro, et al., observed Modulation of Antioxidant Compounds in Organic VsConventional Fruit (Peach, Prunus persica L., and Pear,Pyrus communis L.) [114].
5) Weibo Jianget al., inspected Changes in phenolics and antioxidant property of peach fruit during ripening and responses to 1-methylcyclopropene[115].
6) Ana García-Ibarra et al.,Changes in the antioxidative metabolism induced by Apple chlorotic leaf spot virus infection in peach [Prunus persica (L.) Batsch] [116].
7) Rakesh Raturi et al., observed antioxidant activity of methanolic extract of bark of Prunuspersica[18].
8) C.Font i Forcada et al., observedFruit sugar profile and antioxidants of peach and nectarine cultivarson almond × peach hybrid rootstocks[117].
9) Peerzada R. Hussain et al., Gamma irradiationinducedenhancementofphenylalanineammonia-lyase (PAL) andantioxidantactivityinpeach (Prunus persicaBausch, Cv.Elberta) [118].
10) Kyoung-Hee Kim etal., observed inactivationofcontaminatedfungiandantioxidanteffectsofpeach (Prunus persica L. BatschCVDangeumdo)by0.5–2kGygammairradiation[119].
11) Alex F. Puerta-Gomez et al., examined Postharvest studies beyond fresh market eating quality: Phytochemical antioxidant changes in peach and plum fruit during ripening and advanced senescence[120].
12) Salem Edrah et al., examined Preliminary Phytochemical Screening and Antibacterial Activity of Pistacia atlantica and Prunus persica Plants of Libyan Origin[121].

K. Antimicrobial Activity

Feten Belhadj, et al., detected antimicrobial activitiesduring ripening of Prunus *persica* L. varieties from the North West of Tunisi [111].

L. Antibacterial Activity

Rakesh Raturi et al., observed Antibacterial activity of methanolic extract of bark of *Prunuspersica*[18].

M. Antitumor Activity

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Giuliana Noratto et al.,Polyphenolics from peach (Prunus *persica* var. Rich Lady) inhibit tumor growth andmetastasis of MDA-MB-435 breast cancer cells in vivo [122].

N. Anti-Allergic Inflammatoryavtivity

Tae-Yong Shin et al., detectedAnti-allergic inflammatory activity of the fruit of Prunus *persica*: Role of calciumand NF-jB [123].

O. Anticancer Activity

Chang Ki Lee et al., inspected The Extract of *Prunus persica* Flesh (PPFE)attenuates Chemotherapy-induced Hepatotoxicity in Mice[124].

P. Cholinesterase Inhibitory Activity

Seok-Jong Suh et al., detected Pharmacological Characterization of Orally ActiveCholinesterase Inhibitory Activity of Prunus *persica* Batsch in Rats[125].

Q. Free Radical Scavenging Activity

Lokesh deb et al., inspected Free radical scavenging activity of aqueous n- butanol fraction of *Prunus Persica* l aqueous extract[126].

R. Prokinetic Activity

Wei Han et al., inspected Prokinetic Activity of *Prunus persica* (L.) Batsch Flowers Extract and Its Possible Mechanism of Action in Rats[127].

S. Polyphenoloxidase Activity

Marina Carbonaro et al., Polyphenoloxidase activity and polyphenol levels in organically and conventionally grown peach (Prunus *persica*) [128].

IV. CONCLUSIONS

This review article throws light on the different useful activity of peaches. These are members of the genus p*runus* that includes apricots, plums, cherries, almonds, and nectarines. Peach has prime importance in the wellness of mankind having medicinal properties in its phytochemicals, biological activity, and high nutritive value makes it significant for Human being.

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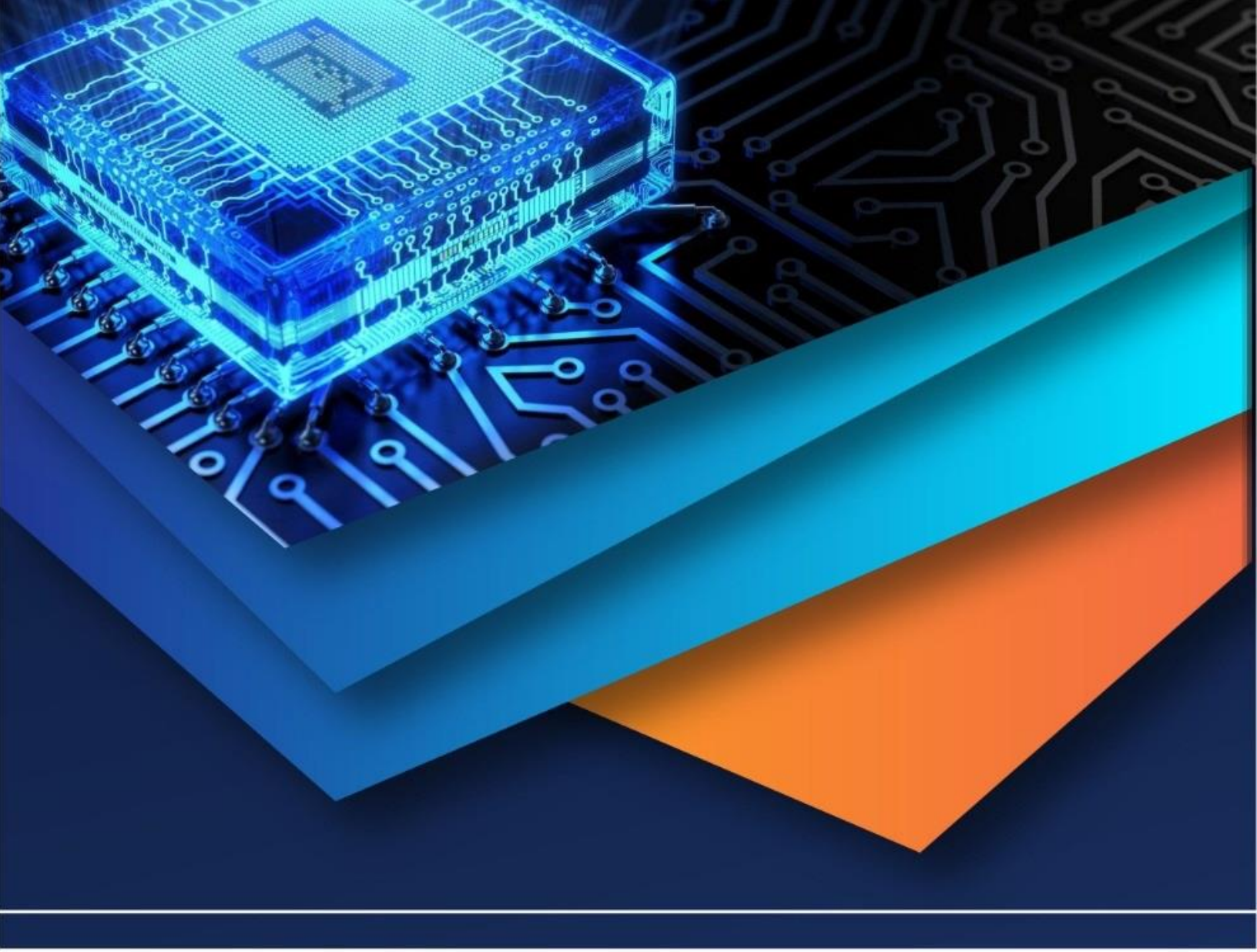
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