horticulturae

Review

Research-Gap-Spotting in Plum–Apricot Hybrids—Bioactive Compounds, Antioxidant Activities, and Health Beneficial Properties

Aneta Popova [1,*], Dasha Mihaylova [2,*], Svetla Pandova [3] and Pavlina Doykina [1]

[1] Department of Catering and Nutrition, University of Food Technologies, 4002 Plovdiv, Bulgaria
[2] Department of Biotechnology, University of Food Technologies, 4002 Plovdiv, Bulgaria
[3] Department of Breeding and Genetic Resources, Fruit Growing Institute, Agricultural Academy, 4000 Plovdiv, Bulgaria
* Correspondence: popova_aneta@yahoo.com (A.P.); dashamihaylova@yahoo.com (D.M.)

Abstract: Plum–apricot hybrids are successful backcrosses of plums and apricots resulting in plumcots, pluots, and apriums. A topic search on plums, apricots, and plumcots shows that extensive information exists on the agro-morphology, genotyping, bioactive substances, and nutritive value of the genus *Prunus*, and plums and apricots, in particular. However, when search results for plum–apricot hybrids were evaluated for the period 2010–2023, only a few papers focused partially on the topic of their metabolomics. A database search (Scopus, PubMed, and Google Scholar) exposed that less than 10 articles/year appeared in Scopus on the topic of plum–apricot hybrids, 618 papers were found on Google Scholar (2010–2023), and only 2 results were found in PubMed for the same period using the same keywords. This shows the grand research opportunity and the need for providing a thorough chemical characterization of the existing plum–apricot hybrids. This review aims at schematizing the available information about plum–apricot hybrids (with reference to their parents), identifying the gaps about their bioactive compounds, antioxidant activities, and health beneficial properties, as well as pointing to future perspectives in terms of fruit hybrid characterization.

Keywords: Prunus; fruit; climacteric; polyphenols; plant-based; sugar

Citation: Popova, A.; Mihaylova, D.; Pandova, S.; Doykina, P. Research-Gap-Spotting in Plum–Apricot Hybrids—Bioactive Compounds, Antioxidant Activities, and Health Beneficial Properties. *Horticulturae* **2023**, *9*, 584. https://doi.org/10.3390/horticulturae9050584

Academic Editor: Li Li

Received: 19 April 2023
Revised: 8 May 2023
Accepted: 12 May 2023
Published: 14 May 2023

1. Introduction

The genus *Prunus* comprises fruits that are very preferred for consumption and encompasses a variety of the species, i.e., apricots, plums, peaches, and cherries, among others [1]. Breeding programs are often oriented to producing fruit with better physical qualities, including an increased yield and most often higher sugar content [2]. In order to provide new varieties, genetic variability is the necessary precondition [3], and the genus *Prunus* offers such conditions. Currently, the European and the Japanese plum are the two most cultivated from the plum species [4]. The apricot tree is far less widespread, and has a limited number of varieties [5]. Apricots are ranked third, after the peach and plum, in economic importance [6].

The great commercial value of the Prunus fruits leads to the pursuit of new varieties and interspecific hybrids. Research has shown large diversity in genotypes in the plum population [7]. Successful backcrosses are those of plums and apricots. The first plum–apricot hybrid was developed around 2012 [8]. The cross between the plum and apricot can result in a plumcot (interspecific hybrid of Japanese plum and apricot) [9], resembling a plum in appearance; a pluot, showing more plum than apricot characteristics; and an aprium, being genetically and morphologically 25% plum and 75% apricot [10]. Plumcots and pluots differ in their pollination, with the first being self-fertile and the second requiring a pollinator. A distant study of the microsatellite markers of plums and pluots showed that 76 alleles were found in pluots, and from which 83% corresponded to plums, while in plumcots −51% came from plums [11]. A recent study has shown that the interspecific plum × apricot hybrids can be clustered into five groups [2]. The same research also pointed out that they resembled the plum more compared to the apricot in terms of morphology and agronomic behavior. Szymajda et al. [12] also pointed out that the plum–apricot hybrids were more dependent on the plum genotype. Halasz et al. [13] identified the self-incompatibility alleles in commercially significant plum and pluot cultivars with unknown incompatibility genotypes. Their research showed that the studied cultivars could be clustered into seven incompatibility groups, each of them containing two to eight cultivars [13]. A study conducted by Soldatov and Salaš extensively reported some physical attributes of plum–apricot hybrids such as tree and crown sizes, leaf characteristics, flowers, and bark [14]. The same authors also presented a biometrical evaluation of the hybrid fruits, explaining differences in the fruit's appearance and yielding capacity. Yaman and Uzun reported the physical attributes (weight, size, fruit/pit ratio, and skin and flesh color) of plum–apricot hybrids [15].

Scientific database searches provide necessary information about the significance and resource availability on various topics. Fruit studies and their thorough characterization are not new to the scientific community. Research detailing their metabolic and volatile profiles is quite common [16], along with their phenological peculiarities and their genetic determinism [17,18]. Furthermore, in view of the sustainable exploitation of resources, effort has been made to utilize the fruit by-products in various industries [19]. Currently, a topic search on plums, apricots, and plumcots showed that extensive information exists on the agro-morphology, genotyping, bioactive substances, and nutritive value of the genus *Prunus*, and plums and apricots, in particular. However, when search results for plum–apricot hybrids were evaluated for the period 2010–2023, only a few papers provided scientifically substantiated information on the topic of their metabolomics and biological activities. Searches in databases such as Scopus, PubMed, and Google Scholar exposed that less than 10 articles/year appeared in Scopus on the topic of plum–apricot hybrids, 618 papers were found on Google Scholar (2010–2023), mainly focused on the phenology, morphology, and breeding programs of plum–apricot hybrids, and only 2 results were found in PubMed for the same period using the same keywords. This reveals a major gap in the research and the need for extensive studies in order to provide a thorough chemical characterization of the existing plum–apricot hybrids.

Subsequently, this review aims at systematizing the available information about plum–apricot hybrids, identifying the gaps about their bioactive compounds, antioxidant activities and health beneficial properties, as well as pointing to future perspectives in terms of fruit hybrid characterization.

2. Metabolic Profile, Bioactive Compounds, and Antioxidant Capacity

Different methods have been applied in the characterization of apricots and plums, i.e., changes through ripening, cultivar variations, and storage changes, among others. However, plum–apricot hybrids have not yet been characterized in terms of their chemical compounds and bioactivity. Only a few papers have published partial information about the chemical composition of apricot–plum hybrids. This leads researchers to gather information about the hybrids' parents, expecting that they will have some, or all, of the reported features with different quantification. Subsequently, this paper's approach is to systematize the available information about the chemical and bioactive compounds reported in both plums and apricots in order to provide grounds for future hybrid examination in view of the existing lack of publications in this particular field.

Sugars, amino acids, organic acids, and lipids are some of the primary metabolites in fruits [20]. Table 1 presents the partial chemical composition and bioactive compounds of plums, apricots, and hybrids.

Table 1. Partial chemical composition and bioactive compounds of plums, apricots, and hybrids.

Representative/ Feature	Plum (*Prunus domestica*)	Apricot (*Prunus armeniaca*)	Plum–Apricot Hybrid	References
Amino acids	glutamic acid (0.196 µg/mg), aspartic acid (0.282 µg/mg), lysine	aspartic acid (0.6–1.2 mg/g), alanine (2.4–3.4 mg/g)	N/A	[21,22]
Sugars	sucrose (31–307.9 mg/g), fructose (134–138.9 mg/g), glucose (91–283.6 mg/g), and sorbitol	fructose, glucose (67.1–132.3 mg/g), inositol (0.9–1.7 mg/g), and sorbitol	sucrose (332–2478 µg/g), fructose (1010–4374 µg/g), glucose (1550–4302 µg/g), and sorbitol (237–2383 µg/g)	[22,23]
Polysaccharides	pectin, cellulose, lignin, fiber	pectin, hemicellulose (2–2.6% DW)	N/A	[24]
Fatty acids	linoleic (12–16.5%), Cis-11-eicosanoic (5.3–19.4%), palmitic (13.3–26.4%) acid	1.8–5.0 mg/g in fruit, 1.05–1.7 mg/g kernel (palmitic acid, linoleic acid, and vaccenic acid)	N/A	[22,23]
Vitamins	ascorbic acid (25.1 mg/100 g)	ascorbic acid	ascorbic acid (73.30 µg/g)	[25]
Carotenoids	β-carotene (694 µg/100), lutein (183 µg/100)	β-carotene (≤16 mg/100 g FW); lycopene	N/A	[26–28]
Minerals	K, Ca, Mg, P (745 mg/100 g)	K, P, Na, Fe	P (17.2 mg/kg), Zn (0.13 mg/kg), Fe (0.14 mg/kg)	[25,29,30]
Phenolic acids	neochlorogenic acid (6.5–60.8 g/kg FW), chlorogenic acid (61.1–129.1 g/kg FW),	chlorogenic acid (7542 µg/100 g DW), gallic acid	N/A	[27,31]
Organic acids	oxalic acid (22–224 µg/g), malic acid (16.8–25.5 g/kg FW), citric acid (2.9–6.9 g/ kg FW), fumaric acid (0.03–0.07 g/kg FW), shikimic (0.07–0.76 g/kg FW), quinic acid (438–2751 µg/g)	malic acid (2.8–26.6 mg/g of FW), citric acid (0.18–20.5 mg/g of FW), fumaric acid (1.6–9.7 mg/g FW), shikimic acid (5.3–13.2 mg/g of FW), tiglic, pyruvic	malic acid (1987–4270 µg/g), citric acid (59–996 µg/g), shikimic acid (12–41 µg/g), quinic acid (405–1149 µg/g)	[26,31,32]
Flavonols, flavonoids	catechin (3.1–6.1 g/kg FW)	rutin (2855 µg/100 g)	N/A	[26,31]
Anthocyanins	cyanidin 3-O-rutinoside, cyanidin 3-O-glucoside	cyanidin-3-O-rutinoside	N/A	[31,33]

N/A—information not available; quantities of compounds are added where provided by the reference.

Variation in the sugar content as well as the organic acid content has been established in various fruits [34]. According to research, oxalic and malic acids were strongly correlated with shikimic acid in apricots and plumcots, while oxalic and quinic acids were highly related in plumcots and plums [32]. Malic and citric acids were the most abundant in plums [31]. Malic acid is in fact reported to possess enhanced chemical–bioactive properties [35]. Organic acids are systematized in papers into the following three groups [36]: anions of citric, isocitric, and malic acids (Krebs cycle intermediates); tartaric acid; and quinic acid (shikimic pathway). Sugars are extremely important for the taste of fresh fruit, and soluble sugars are a key component of the fruit pulp [37]. The sugar content fluctuates during fruit development [38]. Glucose, fructose, and sucrose are most often reported as part of the sugar content of fruit [39]. A high contents of fructose (40.79 mg/100 g) and glucose (44.53 mg/100 g) have been recorded in the literature regarding apricots, mentioning that cultivar differences lead to fluctuation in the sugar content [40]. The total soluble solids parameter is mainly presented by the total sugar content and a small quantity of other organic materials [41]. Shamsolshoara et al. [42] have characterized three hybrids, and have found significant differences in their total soluble solids (16.8 to 20.2 Brix) and titratable acidity (2.6 to 4.6).

The lipid content of most fruits is relatively low, but the fatty acid representatives may provide certain health benefits [43]. The main fatty acids reported for *Prunus* spp. kernel oils were oleic (43.9–78.5%), linoleic (9.7–37%), and palmitic (4.9–7.3%) acids [44]. Reports for *P. armeniaca* L. kernel extracts showed that the predominant fatty acids were palmitoleic (0.08–0.32%), palmitic (27.27–32.70%), linolenic (11.47–17.16), linoleic (42.09–46.99%), oleic (1.32–4.64%), and stearic (2.83–4.15%) [45]. The total lipid content in apricot fruit varied from 0.30 g/100 g FW to 0.88 g/100 g FW [46]. The predominant fatty acids were as follows: linoleic, palmitic, and linolenic, which shows a resemblance with the kernels. The major fatty acids found in plums were linoleic, Cis-11-eicosanoic, and palmitic acids [23].

The nutritional significance of fruits in terms of vitamins and minerals is undeniable. Depending on various factors (temperature, rain, fertilizers, cultivars, sunlight hours, etc.), fruits can accumulate different amounts of metabolites [47]. Fruits are usually rich in vitamin C, carotenoids, and several vitamins from the B group [48]. Dried apricots, for example, are a rich source of calcium, phosphorus, and niacin [30]. Ascorbic acid, being reported in both plums and apricots (Table 1), is important for the metabolic function of the human body [49]. The total ascorbic acid content in plums was reported to be 454 mg/100 g FW [23]. An evaluation of the carotenoid content in apricots showed that three main carotenoids were present, namely β-carotene (2% to 67% of the total carotenoid content), phytoene (6–59%), and phytofluene (12–45%) [50].

The natural antioxidants that exist in fruits fall into the category of non-enzymatic natural antioxidants and subsequently can be divided into four main sub-groups: vitamins, carotenoids, polyphenols (flavonoids and phenolic acids), and minerals [49]. Phenolic compounds are vastly distributed in plant matrices [51]. The rising popularity of free radicals as being responsible for aging, oxidative stress, and various diseases asks for support about the foods rich in natural antioxidants [52]. Literature keeps numerous reports on the topic of *Prunus* spp. antioxidant activity [53,54]. The plum fruit holds a significant amount of total phenolics, while the total anthocyanin and flavonoid contents are higher in the fruit skin and significantly lower in the fruit pulp [55]. The total phenolic content of the "Stanley" plum varied from 70 to 214 mg gallic acid equivalents/100 g fresh weight [51]. Apricot peels also have higher procyanidin, hydroxycinnamic acid, and flavonols content than apricot pulp [56]. Fresh apricot fruits contain high amounts of polyphenols (165.49 mg of GAE/100 g DM) and flavonoids (12.11 mg QE/100 g DM) [57]. Catechin, quercetin-rutinoside, and quercetin-rhamnoside have been identified in plums via RP-UHPLC [58]. The total antioxidant activity in a *P. domestica* × *P. salicina* hybrid was reported to be 809.5 mg TE/100 g [59]. Differences among genotypes in hybrid DPPH antioxidant activity was established to be from 42.4 to 60% [42]. The same authors suggested that the color of the flesh can be related to the antioxidant activity with reference to some compounds such as anthocyanins and phenolics. Drogoudi and Pantelidis studied fruit morphological traits and antioxidant contents in 43 plum cultivars, including 1 pluot [60]. The studied pluot had a total soluble solids (TSS) value of 18.6 Brix, and its antioxidant activity measured via DPPH and FRAP methods was comparable to the "Santa Rosa" plum cultivar. The CUPRAC method is reported to be more sensitive in the existence of flavonoids (quercetin and kaempferol), which is further supported by the results of Alajil et al. considering the antioxidant activity of apricots measured using the three methods [61].

During storage, the metabolic profiles of plums change with an increase in some of the identified lipids, amino acids and their derivatives, organic acids, saccharides and alcohols, nucleotides, and vitamins [62]. Other authors have also established differences in the sugar content, as well as the total phenolic and antioxidant activity in different periods of plum maturation [63]. A clear trend for a decrease or increase or parameters could not be established. However, changes in the metabolite content should be taken into account, especially with reference to the harvesting period of fruit.

Volatile studies aid in the identification of key aroma components in various matrices. To date, no available information exists on the topic of plum–apricot hybrid volatolomics, which provides an understudied field for research. However, the volatile profile of plums and apricots has been reported before. According to the paper of Pino and Quijano [64], 148 components have been identified in fresh plums with 58 esters being the dominant ones. The same authors identified the following components as having aroma characteristics: ethyl 2-methylbutanoate, hexyl acetate, (E)-2-nonenal, ethyl butanoate, (E)-2-decenal, ethyl hexanoate, nonanal, decanal, (E)-β-ionone, γ-dodecalactone, (Z)-3-hexenyl acetate, pentyl acetate, linalool, γ-decalactone, butyl acetate, limonene, propyl acetate, δ-decalactone, diethyl sulfide, (E)-2-hexenyl acetate, ethyl heptanoate, (Z)-3-hexenol, (Z)-3-hexenyl hexanoate, eugenol, (E)-2-hexenal, ethyl pentanoate, hexyl 2-methylbutanoate, isopentyl hexanoate, 1-hexanol, γ-nonalactone, myrcene, octyl acetate, phenylacetaldehyde, 1-butanol, isobutyl acetate, (E)-2-heptenal, octadecanal, and nerol. Far less compounds (75 in total) were reported for apricots, where alcohols were the dominant ones [65]. The important volatiles were (E)-2-hexenol, (E)-2-hexenal, hexenal, benzylalcohol, (Z)-3-hexenal, and y-caprolactone.

The natural substance amygdalin is a cyanogenic glycoside [66] that can be found in various representatives of the genus *Prunus* [67]. Research on the topic of its pharmacological and toxicological effects is growing [68]. The content of amygdalin fluctuates significantly between bitter and sweet apricot kernels and the genotype is highly influential on its content [69]. Amygdalin is also found in plum seeds [70]. The plum–apricot hybrids might also possess different amounts of this cyanogenic glycoside, but no information has currently been published on this topic.

Since plumcots and pluots hold the predominant features of plums, it might be suggested that chemically they will be more similar to plums too. It would be of interest to support this presumption with future research, especially when it comes to the content of amino and phenolic acids, polysaccharides, vitamins, and minerals. Solely, the paper of Bae et al. [32] shows a similarity in the organic acid content of apricots and plumcots in the early stages of ripening and then a similarity to the plum in the late stages of ripening. Correspondingly, apriums are more resemblant of apricots, which may indicate composition resemblance to the apricot. Again, future research is needed to support or refute the abovementioned assumptions.

3. Health Beneficial Properties

Phytochemicals are bioactive compounds created from secondary plant metabolism [71] that play a key role in the mechanisms of inflammation and oxidation [72]. Phytonutrients consist of various chemicals, i.e., carotenoids, glucosinolates, phytosterols, polyphenols, and saponins, among others [73]. Phyto-nutrition discovers the action of plant molecules in the incorporation in a daily diet with health beneficial effects [73] by clarifying the mode of action in their active ingredients [74]. The plum–apricot hybrids present a major research challenge due to the grand prerequisites of their parents in terms of health benefits. A detailed nutritional profile, as well as their biological activity, should provide more information on their expected beneficial properties. Currently, no information about their beneficial properties is available to the vast audience. Hence, this section presents the health beneficial properties of plums and apricots as parents to plum–apricot hybrids.

A comprehensive review of the therapeutic and pharmacological potential of the *Prunus domestica* revealed its antioxidant, anticancer, antihyperglycemic, antihyperlipidemic, and anti-osteoporosis properties [75]. The apricot has been reported to be favorable for liver disorders, inflammation, and respiratory and digestive diseases [76,77]. There is some evidence that apricot consumption may positively influence hepatic steatosis, high cholesterol, high homocysteine levels, and atherosclerosis [78].

3.1. Antihyperlipidemic Properties (Cholesterol Control)

A diet rich in fruit and vegetables can lead to a wide selection of health benefits [79]. Due to their metabolic profiles, the consumption of plums may be accountable for the improving parameters of the lipid profile by lowering the total cholesterol and LDL levels [80]. It is suggested that the presence of both fiber and polyphenol components in *Prunus* spp.

can result in cholesterol control [81]. Dietary fiber can lower the cholesterol concentrations by enhancing sterol secretion and bile acid transformation [51].

3.2. Anticancer Properties

There are various types of cancer cells. Many plant extracts are reported to be able to influence cancer progression. The mechanisms involved in the anticancer activity of *Prunus armeniaca* L. include a reduction in tumor growth, increased antioxidant protection, and decreased angiogenesis [82]. The natural compounds in *Prunus armeniaca* are successfully reported to have potency against various types of cancer; reduce liver damage; act as cardio- and neuroprotectants by stimulating antioxidant defense via superoxide dismutase, catalase, and glutathione, and decrease pro-inflammatory cytokine levels [82]. A comprehensive review of the therapeutic and pharmacological potential of the *Prunus domestica* revealed its anticancer properties via a reduction in cancer cell growth [75]. The same authors revealed that ethanol extracts, immature plum extracts, and antioxidant fractions of prunes are used in the treatment of leukemia, human cervical carcinoma, colon carcinoma, and breast cancer cells, among others. It has been suggested that the presence of protocatechuic acid might be accountable for these properties [83]. The plum fruit has exhibited anticancer activity against three cell lines: the liver, colorectal adenocarcinoma, and breast cell lines [84]. Plum extracts, plum juices, and plum wines have also been reported to exhibit cancer-protective effects [85].

3.3. Anti-Osteoporosis Properties

Some evidence supports the efficacy of dried plum ($\leq$100 g/daily) supplementation on bone mineral density improvement [86]. The review of Wallace [87] systematizes twenty-four cell, animal, population, and clinical studies, which all report an improvement in markers measuring bone health, i.e., alkaline phosphatase, bone alkaline phosphatase, and bone mineral density. Minerals such as calcium, phosphorus, and magnesium were also established in some of the reported studies. Here, the polyphenolic profile of prunes might also be accountable for the established properties.

3.4. Anti-Inflammatory Activities

Phenolic-rich fruits usually possess anti-inflammatory properties via the intracellular reactive O_2 species level reduction which could lead to inflammation process inhibition via nitric oxide production reduction [88]. Apricot seeds are considered to possess antioxidant, antimicrobial, and anti-inflammatory activities due to their bioactive components (tocopherols, terpenoids, and phenolic compounds) [89].

3.5. Gut Microbiota Support

Not much research has focused on the gut microbiome support of *Prunus domestica* on the gastrointestinal tract, although prunes are believed to maintain bowel function. Lever et al. [90] have proven that dried plum consumption increased stool weight and frequency in healthy individuals with low fiber intake. Another study also reported that 12-month dietary supplementation of prunes (50–100 g/day) altered gut microbiome by decreasing the evenness in bacteria taxa [91]. An updated review of Alasalvar et al. [92] on the effect of dried fruit on microbiome showed that prunes supplementation increased *Bifidobacteria* thriving.

3.6. Enzyme Inhibition (Antihyperglycemic and Neuroprotective Activities)

Mdern lifestyle is associated with poor dietary choices, resulting in the expression of being overweight, obesity, type II diabetes, and insulin resistance, among others [93]. The ability of plant extracts to inhibit the activity of various enzymes is important to the scientific community. In particular, the capability of plant extracts to inhibit α-glucosidase, α-amylase, and lipase are some of the most common assays used in research in order to potentially discover antidiabetic and anti-obesity control drugs [94]. The pursuit for prevention through nutrition is provoking the seeking of new sources of bioactive molecules that can be successfully incorporated into drug discovery programs. Several *Prunus* spp. have been reported to be able to inhibit the activity of α-amylase, α-glucosidase, lipase, acetylcholinesterase, and tyrosinase, among others. Polyphenol-enriched extracts have been documented to inhibit the activity of key glycolytic enzymes [95,96]. The study of Vahedi-Mazdabadi et al. discovered that the aqueous extract of bitter apricot kernels exhibited strong in vitro acetylcholinesterase inhibitory and neuroprotective effects [97].

4. Applications

Fruit production is not limited to the direct consumption of the ripe fruit but to its application in cosmetology, food technology, and pharmacology, among other industries. At present, fruit and vegetable by-products are a trending topic of research in line with the growing need for a sustainable life cycle. Figure 1 presents the applications of *Prunus* spp. in different fields.

Figure 1. *Prunus* spp. applications. Photos used for figure were downloaded from freepik.com where no copyright was applied.

An obvious application of fruit is the preparation of jams, marmalades, syrups, nectars, and other methods of fruit conservation, such as compote production and fruit drying. For instance, plum jams show a good source of nutritional and health beneficial chemical composition [98]. Authors have also focused on plum wines with various characteristics [99,100]. Due to their specific properties, such as lipid oxidant inhibition, dried plums are seen as prosperous for their inclusion in meat products [101]. Plum peels have also been investigated as an ingredient in halva Masghati [102]. Osmotic dehydration and convective drying are some examples of methods used for fruit preservation [103]. Authors have studied the influence of drying conditions on fruit quality via convective airflow drying, freezing, freeze drying, and swell drying, and have documented that although these techniques appear to be acceptable, further studies are needed to optimize these processes [104]. Apricot kernels are used to produce a flour mix of apricot, peach, and mango, as an additive to baked goods, due to their protein mineral contents [105]. Food emulsifiers and stabilizers from apricot seed residue are promising natural products, with prospective industrial and medicinal benefits [106].

Authors have investigated the stability of plum fruit phenolic extracts with the use of microencapsulation, pointing out that this is a promising technique that requires further evaluation in terms of the interaction of plum phenolics with other food components [107].

Since polyphenols are present in most plant matrices, various fruit extracts can be found as components in the cosmetology field. *Prunus* extracts have been successfully used as active ingredients in body wash formulations [108]. Plant extracts, with distinct antioxidant properties, have also been applied in edible coating production in the pursuit of shelf-life extension [109]. Kernal oils have long been used for problems such as dermatitis, with their anti-aging properties and general brightening effect. Research has presented apricot seeds as those with cosmetic and dietary applications [110]. Apricots have been reported to express antimicrobial activity, specifically against skin diseases [111].

Currently, much attention is being paid to the topic of the valorization of fruit by-products, and their applications in various industries. A recent investigation looked at apricot pulp waste as a source of antioxidant polyphenols and carotenoid pigments and the study concluded that apricot waste can indeed be a rich source of bioactive compounds [112]. Another paper highlighted that plum by-products can be reincorporated into the food supply chain in view of the circular economy due to their antioxidant and antimicrobial activities [113]. An apricot pomace 2-propanol extract has been reported to exhibit an inhibiting effect on mild steel corrosion [114].

All of the abovementioned applications can successfully be applied to plum–apricot hybrids because they fully resemble their parents in a morphological and phenological way. However, addition topic (plum-apricot hybrid) research and the publication of the results is needed so that any claim can be completely supported by scientific evidence.

5. Conclusions and Future Perspectives

Plum–apricot hybrids are one of the successes of breeding programs. Although the first plum–apricot hybrid appeared nearly 10 years ago, these fruits are still understudied in terms of nutritive value, biological activity, and health beneficial properties. A topic search in scientific databases shows that little information about their chemical composition and related biological activities is available, contrary to the phenology, morphology, and breeding programs of plum–apricot hybrids.

Nevertheless, plumcot's, pluot's, and aprium's parents (plums and apricots) are well characterized, which gives grounds for expected health beneficial properties and predominant substances. This reveals a major gap in the research and the need for extensive studies in order to provide a thorough chemical characterization and the biological activity of the existing plum–apricot hybrids. Bearing in mind the existing reports on plums and apricots regarding some features such as antioxidant, anticancer, antihyperglycemic, antihyperlipidemic, and anti-osteoporosis properties, it is of particular interest to be able to apply those features to the hybrids as well. Functional properties in foods are a valuable trait in the prism of prevention via nutrition.

Sustainable agricultural approaches rarely include hybrid fruits as they lack substantial characterization. The implementation of the European Green deal strategy can propose the need for more information on the sustainable agriculture systems in plant management. Concerns about the high cost of maintenance and the need for increasing food demand sets immediate societal challenges. Hybrid orchards currently only exist exclusively in research institutes. Actions should be taken so that they become more widespread and studied. Sustainable farming systems need to have a social dimension as many farmers are struggling to meet market criteria and decide to abandon their produce. A general consideration is the shifting of farmers to more profitable crops when the market applies immediate pressure. Since the world is constantly becoming less biodiverse, it is important to set the record for existing biodiversity [115].

A database on fruit hybrids could be extremely valuable not only to the scientific community but also to farmers, facilitating the identification and description of hybrid representatives. Some hybrids might exist only by their common name, and this makes it difficult to compare and contrast results in the literature. Currently, databases for genome and transcriptome data exist [116,117], but no systematized records on metabolomics are available. Furthermore, the development of mobile applications with abilities for knowledge exchange will significantly aid farmers. Publications including a sensory evaluation of fruits are not new to the scientific community [118] but are currently non-existent for plum–apricot hybrids. By conducting such investigations, grounds for the development of new food products are set. For example, sorbets are a trending research topic [119] and plum–apricot hybrids can be applied in such desserts.

Disease management in agriculture is also a major topic of research that needs to be addressed properly. If plum–apricot hybrids are reported to have easier maintenance in terms of disease, this can be a prerequisite for their vast spread. Another beneficial, but currently not exploited, feature of plum–apricot hybrids is their ability to bear frost damage, which is a continuous issue with no resolution for fruit farmers.

Organic production is another branch of agriculture that will be promising in the future, although limited data are available about production practices [120]. Research has shown that hybrid production can be comparable in scale with organic one bearing in mind sustainable cultivation and the conservation of traditional varieties [120].

Crossbreeding will continue to be a research topic aiding agriculture in continuing to be modern, resource-efficient, and competitive in relation to other sectors.

Author Contributions: Conceptualization, A.P. and D.M.; investigation, A.P., D.M., S.P. and P.D.; writing—original draft preparation, A.P., D.M., S.P. and P.D.; writing—review and editing, A.P., D.M., S.P. and P.D.; visualization, A.P., D.M. and S.P.; project administration, A.P.; funding acquisition, A.P. All authors have read and agreed to the published version of the manuscript.

Funding: The APC was funded by the Bulgarian National Science Fund, grant number KП-06-H67/2.

Data Availability Statement: Not applicable.

Acknowledgments: This work was supported by the Bulgarian National Science Fund, project No. KП-06-H67/2 (granted to Aneta Popova). The authors would like to acknowledge Argir Zhivondov for actively working on expanding plumcot varieties in Bulgaria, and registering the "Stendesto".

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Popova, A.; Mihaylova, D.; Alexieva, I.; Doykina, P. Ethnopharmacology and Phytochemistry of Some Representatives of the Genus Prunus. *J. Cent. Eur. Agric.* **2022**, *23*, 665–678. [CrossRef]
2. Guerrero, B.I.; Guerra, M.E.; Rodrigo, J. Simple Sequence Repeat (SSR)-Based Genetic Diversity in Interspecific Plumcot-Type (*Prunus salicina x Prunus armeniaca*) Hybrids. *Plants* **2022**, *11*, 1241. [CrossRef]
3. Liu, W.; Liu, D.; Zhang, A.; Feng, C.; Yang, J.; Yoon, J.; Li, S. Genetic Diversity and Phylogenetic Relationships among Plum Germplasm Resources in China Assessed with Inter-Simple Sequence Repeat Markers. *J. Am. Soc. Hortic. Sci.* **2007**, *132*, 619–628. [CrossRef]
4. Gago, D.; Sánchez, C.; Aldrey, A.; Christie, C.B.; Bernal, M.Á.; Vidal, N. Micropropagation of Plum (*Prunus domestica* L.) in Bioreactors Using Photomixotrophic and Photoautotrophic Conditions. *Horticulturae* **2022**, *8*, 286. [CrossRef]
5. Yilmaz, K.U.; Gurcan, K.; Yilmaz, K.U.; Gurcan, K. Genetic Diversity in Apricot. *Genet. Divers. Plants* **2012**, *13*, 249–270. [CrossRef]
6. Wani, A.A.; Zargar, S.A.; Malik, A.H.; Kashtwari, M.; Nazir, M.; Khuroo, A.A.; Ahmad, F.; Dar, T.A. Assessment of Variability in Morphological Characters of Apricot Germplasm of Kashmir, India. *Sci Hortic* **2017**, *225*, 630–637. [CrossRef]
7. Głowacka, A.; Sitarek, M.; Rozpara, E.; Podwyszyńska, M. Pomological Characteristics and Ploidy Levels of Japanese Plum (*Prunus salicina* Lindl.) Cultivars Preserved in Poland. *Plants* **2021**, *10*, 884. [CrossRef]
8. Nyawo, T.A. Fingerprinting and Molecular Characterisation of ARC's Apricot and Plum Collection. Master's Thesis, Stellenbosch University, Stellenbosch, South Africa, 2017.
9. Frecon, J.L.; Ward, D.L. Testing and Evaluation of Plum and Plum Hybrid Cultivars. *Fruit Notes* **2012**, *77*, 12–22.
10. Eierman, C. *Fruit Trees in Small Spaces: Abundant Harvests from Your Own Backyard*; Timber Press: London, UK, 2012; ISBN 9781604691900.
11. Ahmad, R.; Potter, D.; Southwick, S.M. Identi®cation and Characterization of Plum and Pluot Cultivars by Microsatellite Markers. *J. Hortic. Sci. Biotechnol.* **2015**, *79*, 164–169. [CrossRef]
12. Szymajda, M.; Studnicki, M.; Kuras, A.; Żurawicz, E. Cross-Compatibility in Interspecific Hybridization between Three Prunus Species. *S. Afr. J. Bot.* **2022**, *146*, 624–633. [CrossRef]

13. Halász, J.; Hegedus, A.; Szabó, Z.; Nyéki, J.; Pedryc, A. DNA-Based S-Genotyping of Japanese Plum and Pluot Cultivars to Clarify Incompatibility Relationships. *HortScience* **2007**, *42*, 46–50. [CrossRef]
14. Soldatov, I.V.; Salaš, P. Hybridization of Domestic Prunes with Black Apricot (*Prunus dosmestica* L. x *Armeniaca dasycarpa* Ehrn.). *Acta Univ. Agric. Et Silvic. Mendel. Brun.* **2007**, *55*, 147–154. [CrossRef]
15. Yaman, M.; Uzun, A. Evaluation of Superior Hybrid Individuals with Intra and Interspecific Hybridization Breeding in Apricot. *Int. J. Fruit Sci.* **2020**, *20*, S2045–S2055. [CrossRef]
16. Bai, J.; Jordán, M.J.; Li, J. Editorial: Metabolism of Fruit Volatile Organic Compounds. *Front. Plant Sci.* **2022**, *13*, 1586. [CrossRef]
17. Cosmulescu, S.; Ștefănescu, D.; Stoenescu, A.M. Variability of Phenological Behaviours of Wild Fruit Tree Species Based on Discriminant Analysis. *Plants* **2021**, *11*, 45. [CrossRef]
18. Gallinat, A.S.; Primack, R.B.; Willis, C.G.; Nordt, B.; Stevens, A.D.; Fahey, R.; Whittemore, A.T.; Du, Y.; Panchen, Z.A. Patterns and Predictors of Fleshy Fruit Phenology at Five International Botanical Gardens. *Am. J. Bot.* **2018**, *105*, 1824–1834. [CrossRef]
19. Nirmal, N.P.; Khanashyam, A.C.; Mundanat, A.S.; Shah, K.; Babu, K.S.; Thorakkattu, P.; Al-Asmari, F.; Pandiselvam, R. Valorization of Fruit Waste for Bioactive Compounds and Their Applications in the Food Industry. *Foods* **2023**, *12*, 556. [CrossRef]
20. Gu, L.; Zhang, Z.Y.; Quan, H.; Li, M.J.; Zhao, F.Y.; Xu, Y.J.; Liu, J.; Sai, M.; Zheng, W.L.; Lan, X.Z. Integrated Analysis of Transcriptomic and Metabolomic Data Reveals Critical Metabolic Pathways Involved in Rotenoid Biosynthesis in the Medicinal Plant Mirabilis Himalaica. *Mol. Genet. Genom.* **2018**, *293*, 635–647. [CrossRef]
21. Lenchyk, L.; Upyr, T.; Mohammed, S.; Komisarenko, M. Study of Amino Acid Composition of *Prunus domestica* Fruits Pectin Complex. *Int. J. Pharm. Chem.* **2020**, *6*, 60. [CrossRef]
22. Farag, M.A.; Ramadan, N.S.; Shorbagi, M.; Farag, N.; Gad, H.A. Profiling of Primary Metabolites and Volatiles in Apricot (*Prunus armeniaca* L.) Seed Kernels and Fruits in the Context of Its Different Cultivars and Soil Type as Analyzed Using Chemometric Tools. *Foods* **2022**, *11*, 1339. [CrossRef]
23. Murathan, Z.T.; Arslan, M.; Erbil, N. Analyzing Biological Properties of Some Plum Genotypes Grown in Turkey. *Int. J. Fruit Sci.* **2020**, *20*, S1729–S1740. [CrossRef]
24. Lahaye, M.; Falourd, X.; Quemener, B.; Devaux, M.F.; Audergon, J.M. Histological and Cell Wall Polysaccharide Chemical Variability among Apricot Varieties. *LWT* **2014**, *58*, 486–496. [CrossRef]
25. Zhu, G.-P.; Zhao, H.; Zhou, X.-X.; Liu, M.-P.; Huang, Y.-L.; Wuyun, T.-N.; Li, F.-D. *Prunus domestica* × P. Armeniaca Cultivar Fengweimeigui: A New Natural Material for Fruit Wine. *Adv. J. Food Sci. Technol.* **2016**, *10*, 277–280. [CrossRef]
26. Fratianni, F.; Ombra, M.N.; d'Acierno, A.; Cipriano, L.; Nazzaro, F. Apricots: Biochemistry and Functional Properties. *Curr. Opin. Food Sci.* **2018**, *19*, 23–29. [CrossRef]
27. Kan, T.; Gundogdu, M.; Ercisli, S.; Muradoglu, F.; Celik, F.; Gecer, M.K.; Kodad, O.; Zia-Ul-Haq, M. Phenolic Compounds and Vitamins in Wild and Cultivated Apricot (*Prunus armeniaca* L.) Fruits Grown in Irrigated and Dry Farming Conditions. *Biol. Res.* **2014**, *47*, 46. [CrossRef]
28. Kaulmann, A.; Jonville, M.C.; Schneider, Y.J.; Hoffmann, L.; Bohn, T. Carotenoids, Polyphenols and Micronutrient Profiles of Brassica Oleraceae and Plum Varieties and Their Contribution to Measures of Total Antioxidant Capacity. *Food Chem.* **2014**, *155*, 240–250. [CrossRef]
29. Stacewicz-Sapuntzakis, M.; Bowen, P.E.; Hussain, E.A.; Damayanti-Wood, B.I.; Farnsworth, N.R. Chemical Composition and Potential Health Effects of Prunes: A Functional Food? *Crit. Rev. Food Sci. Nutr.* **2010**, *41*, 251–286. [CrossRef]
30. Khan, S.; Arya, R.; Singh, I. A Review Paper on Fruit Nutrition and Health Benefits. *Pharma. Innov. J.* **2021**, *10*, 119–123.
31. Drkenda, P.; Music, O.; Oras, A.; Haracic, S.; Haseljic, S.; Blanke, M.; Hudina, M. Sugar, Acid and Phenols in Fruit of the Sharka-Tolerant Autochthonous Plum Genotype 'Mrkosljiva'. *Erwerbs-Obstbau* **2022**, *64*, 569–580. [CrossRef]
32. Bae, H.; Yun, S.K.; Jun, J.H.; Yoon, I.K.; Nam, E.Y.; Kwon, J.H. Assessment of Organic Acid and Sugar Composition in Apricot, Plumcot, Plum, and Peach during Fruit Development. *J. Appl. Bot. Food Qual.* **2014**, *87*, 24–29. [CrossRef]
33. Bureau, S.; Renard, C.M.G.C.; Reich, M.; Ginies, C.; Audergon, J.M. Change in Anthocyanin Concentrations in Red Apricot Fruits during Ripening. *LWT-Food Sci. Technol.* **2009**, *42*, 372–377. [CrossRef]
34. Naryal, A.; Acharya, S.; Kumar Bhardwaj, A.; Kant, A.; Chaurasia, O.P.; Stobdan, T. Altitudinal Effect on Sugar Contents and Sugar Profiles in Dried Apricot (*Prunus armeniaca* L.) Fruit. *J. Food Compos. Anal.* **2019**, *76*, 27–32. [CrossRef]
35. Marques, C.; Sotiles, A.R.; Farias, F.O.; Oliveira, G.; Mitterer-Daltoé, M.L.; Masson, M.L. Full Physicochemical Characterization of Malic Acid: Emphasis in the Potential as Food Ingredient and Application in Pectin Gels. *Arab. J. Chem.* **2020**, *13*, 9118–9129. [CrossRef]
36. Famiani, F.; Battistelli, A.; Moscatello, S.; Cruz-Castillo, J.G.; Walker, R.P. The Organic Acids That Are Accumulated in the Flesh of Fruits: Occurrence, Metabolism and Factors Affecting Their Contents—A Review. *Rev. Chapingo Ser. Hortic.* **2015**, *21*, 97–128. [CrossRef]
37. Cakpo, C.B.; Vercambre, G.; Baldazzi, V.; Roch, L.; Dai, Z.; Valsesia, P.; Memah, M.M.; Colombié, S.; Moing, A.; Gibon, Y.; et al. Model-Assisted Comparison of Sugar Accumulation Patterns in Ten Fleshy Fruits Highlights Differences between Herbaceous and Woody Species. *Ann. Bot.* **2020**, *126*, 455–470. [CrossRef]
38. Dai, Z.; Wu, H.; Baldazzi, V.; van Leeuwen, C.; Bertin, N.; Gautier, H.; Wu, B.; Duchêne, E.; Gomès, E.; Delrot, S.; et al. Inter-Species Comparative Analysis of Components of Soluble Sugar Concentration in Fleshy Fruits. *Front. Plant Sci.* **2016**, *7*, 649. [CrossRef]

39. Mihaylova, D.; Popova, A.; Desseva, I.; Petkova, N.; Stoyanova, M.; Vrancheva, R.; Slavov, A.; Slavchev, A.; Lante, A. Comparative Study of Early- and Mid-Ripening Peach (*Prunus persica* L.) Varieties: Biological Activity, Macro-, and Micro- Nutrient Profile. *Foods* **2021**, *10*, 164. [CrossRef]
40. Waseem, M.; Naqvi, S.A.; Haider, M.S.; Shahid, M.; Jaskani, M.J.; Khan, I.A.; Abbas, H. Antioxidant activity, sugar quantification, and phytochemical and physical profiling of apricot varieties of chitral and gilgit-pakistan. *Pak. J. Bot* **2021**, *53*, 1407–1415. [CrossRef]
41. Kusumiyati; Hadiwijaya, Y.; Putri, I.E.; Mubarok, S.; Hamdani, J.S. Rapid and Non-Destructive Prediction of Total Soluble Solids of Guava Fruits at Various Storage Periods Using Handheld near-Infrared Instrument. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *458*, 012022. [CrossRef]
42. Shamsolshoara, Y.; Miri, S.M.; Gharesheikhbayat, R.; Pirkhezri, M.; Davoodi, D. Phenological, Morphological, and Pomological Characterizations of Three Promising Plum and Apricot Natural Hybrids. *Taiwania* **2021**, *66*, 466–477. [CrossRef]
43. Bajramova, A.; Spégel, P. A Comparative Study of the Fatty Acid Profile of Common Fruits and Fruits Claimed to Confer Health Benefits. *J. Food Compos. Anal.* **2022**, *112*, 104657. [CrossRef]
44. MatthÄus, B.; Özcan, M.M. Fatty Acids and Tocopherol Contents of Some Prunus Spp. Kernel Oils. *J. Food Lipids* **2009**, *16*, 187–199. [CrossRef]
45. Hrichi, S.; Rigano, F.; Chaabane-Banaoues, R.; El Majdoub, Y.O.; Mangraviti, D.; Di Marco, D.; Babba, H.; Dugo, P.; Mondello, L.; Mighri, Z.; et al. Identification of Fatty Acid, Lipid and Polyphenol Compounds from *Prunus armeniaca* L. Kernel Extracts. *Foods* **2020**, *9*, 896. [CrossRef] [PubMed]
46. Pintea, A.; Dulf, F.V.; Bunea, A.; Socaci, S.A.; Pop, E.A.; Opriță, V.A.; Giuffrida, D.; Cacciola, F.; Bartolomeo, G.; Mondello, L. Carotenoids, Fatty Acids, and Volatile Compounds in Apricot Cultivars from Romania—A Chemometric Approach. *Antioxidants* **2020**, *9*, 562. [CrossRef]
47. Pott, D.M.; Vallarino, J.G.; Osorio, S. Metabolite Changes during Postharvest Storage: Effects on Fruit Quality Traits. *Metabolites* **2020**, *10*, 187. [CrossRef]
48. Rejman, K.; Górska-Warsewicz, H.; Kaczorowska, J.; Laskowski, W. Nutritional Significance of Fruit and Fruit Products in the Average Polish Diet. *Nutrients* **2021**, *13*, 2079. [CrossRef]
49. Arias, A.; Feijoo, G.; Moreira, M.T. Exploring the Potential of Antioxidants from Fruits and Vegetables and Strategies for Their Recovery. *Innov. Food Sci. Emerg. Technol.* **2022**, *77*, 102974. [CrossRef]
50. Shemesh, K.; Zohar, M.; Bar-Ya'Akov, I.; Hatib, K.; Holland, D.; Isaacson, T. Analysis of Carotenoids in Fruit of Different Apricot Accessions Reveals Large Variability and Highlights Apricot as a Rich Source of Phytoene and Phytofluene. *Fruits* **2017**, *72*, 185–202. [CrossRef]
51. Walkowiak-Tomczak, D.; Reguła, J.; Łysiak, G. Physico-Chemical Properties and Antioxidant Activity of Selected Plum Cultivar Fruit. *ACTA Acta Sci. Pol. Technol. Aliment* **2008**, *7*, 15–22.
52. Sadowska-Bartosz, I.; Bartosz, G. Evaluation of The Antioxidant Capacity of Food Products: Methods, Applications and Limitations. *Processes* **2022**, *10*, 2031. [CrossRef]
53. Mihaylova, D.; Popova, A.; Dincheva, I. Pattern Recognition of Varieties of Peach Fruit and Pulp from Their Volatile Components and Metabolic Profile Using HS-SPME-GC/MS Combined with Multivariable Statistical Analysis. *Plants* **2022**, *11*, 3219. [CrossRef] [PubMed]
54. Miletić, N.; Popović, B.; Mitrović, O.; Kandić, M. Phenolic Content and Antioxidant Capacity of Fruits of Plum Cv. "Stanley" (*Prunus domestica* L.) as Influenced by Maturity Stage and on-Tree Ripening. *AJCS* **2012**, *6*, 681–687.
55. Trendafilova, A.; Ivanova, V.; Trusheva, B.; Kamenova-Nacheva, M.; Tabakov, S.; Simova, S. Chemical Composition and Antioxidant Capacity of the Fruits of European Plum Cultivar "Čačanska Lepotica" Influenced by Different Rootstocks. *Foods* **2022**, *11*, 2844. [CrossRef] [PubMed]
56. Suleria, H.A.R.; Barrow, C.J.; Dunshea, F.R. Screening and Characterization of Phenolic Compounds and Their Antioxidant Capacity in Different Fruit Peels. *Foods* **2020**, *9*, 1206. [CrossRef] [PubMed]
57. Bousselma, A.; Abdessemed, D.; Tahraoui, H.; Zedame, F.; Amrane, A. Polyphenols and Flavonoids Contents of Fresh and Dried Apricots Extracted by Cold Soaking and Ultrasound-Assisted Extraction. *Kem. U Ind.* **2023**, *72*, 161–168. [CrossRef]
58. Ullah, H.; Sommella, E.; Santarcangelo, C.; D'avino, D.; Rossi, A.; Dacrema, M.; Di Minno, A.; Di Matteo, G.; Mannina, L.; Campiglia, P.; et al. Hydroethanolic Extract of *Prunus domestica* L.: Metabolite Profiling and In Vitro Modulation of Molecular Mechanisms Associated to Cardiometabolic Diseases. *Nutrients* **2022**, *14*, 340. [CrossRef] [PubMed]
59. Wolf, J.; Göttingerová, M.; Kaplan, J.; Kiss, T.; Venuta, R.; Nečas, T. Determination of the Pomological and Nutritional Properties of Selected Plum Cultivars and Minor Fruit Species. *Hortic. Sci.* **2020**, *47*, 181–193. [CrossRef]
60. Drogoudi, P.; Pantelidis, G. Phenotypic Variation and Peel Contribution to Fruit Antioxidant Contents in European and Japanese Plums. *Plants* **2022**, *11*, 1338. [CrossRef]
61. Alajil, O.; Sagar, V.R.; Kaur, C.; Rudra, S.G.; Sharma, R.R.; Kaushik, R.; Verma, M.K.; Tomar, M.; Kumar, M.; Mekhemar, M. Nutritional and Phytochemical Traits of Apricots (*Prunus armeniaca* L.) for Application in Nutraceutical and Health Industry. *Foods* **2021**, *10*, 1344. [CrossRef]
62. Lin, X.; Huang, S.; Zhang, Q.; Zhu, S.; Dong, X. Changes in the Primary Metabolites of 'Fengtang' Plums during Storage Detected by Widely Targeted Metabolomics. *Foods* **2022**, *11*, 2830. [CrossRef]

63. Moscatello, S.; Frioni, T.; Blasi, F.; Proietti, S.; Pollini, L.; Verducci, G.; Rosati, A.; Walker, R.P.; Battistelli, A.; Cossignani, L.; et al. Changes in Absolute Contents of Compounds Affecting the Taste and Nutritional Properties of the Flesh of Three Plum Species Throughout Development. *Foods* **2019**, *8*, 486. [CrossRef] [PubMed]
64. Pino, J.A.; Quijano, C.E. Study of the Volatile Compounds from Plum (*Prunus domestica* L. Cv. Horvin) and Estimation of Their Contribution to the Fruit Aroma. *Ciênc. Tecnol. Aliment* **2012**, *32*, 76–83. [CrossRef]
65. Goliáš, J.; Létal, J.; Kožíšková, J.; Dokoupil, L. Formation of Volatiles in Apricot (*Prunus armeniaca* L.) Fruit during Post-Harvest Ripening. *Mitt. Klosterneubg.* **2013**, *63*, 96–107.
66. Alwan, A.M.; Rokaya, D.; Kathayat, G.; Afshari, J.T. Onco-Immunity and Therapeutic Application of Amygdalin: A Review. *J. Oral Biol. Craniofacial Res.* **2023**, *13*, 155–163. [CrossRef]
67. Bolarinwa, I.F.; Orfila, C.; Morgan, M.R.A. Amygdalin Content of Seeds, Kernels and Food Products Commercially-Available in the UK. *Food Chem.* **2014**, *152*, 133–139. [CrossRef]
68. Saberi Hasanabadi, P.; Shaki, F. The Pharmacological and Toxicological Effects of Amygdalin: A Review Study. *Pharm. Biomed. Res.* **2022**, *8*, 1–12. [CrossRef]
69. Naryal, A.; Bhardwaj, P.; Kant, A.; Chaurasia, O.; Stobdan, T. Altitude and Seed Phenotypic Effect on Amygdalin Content in Apricot (*Prunus armeniaca* L.) Kernel. *Pharmacogn. J.* **2019**, *11*, 332–337. [CrossRef]
70. Savic, I.M.; Savic Gajic, I.M. Determination of Physico-Chemical and Functional Properties of Plum Seed Cakes for Estimation of Their Further Industrial Applications. *Sustainability* **2022**, *14*, 12601. [CrossRef]
71. Zaynab, M.; Fatima, M.; Abbas, S.; Sharif, Y.; Umair, M.; Zafar, M.H.; Bahadar, K. Role of Secondary Metabolites in Plant Defense against Pathogens. *Microb. Pathog.* **2018**, *124*, 198–202. [CrossRef]
72. Zhang, H.; Tsao, R. Dietary Polyphenols, Oxidative Stress and Antioxidant and Anti-Inflammatory Effects. *Curr. Opin. Food Sci.* **2016**, *8*, 33–42. [CrossRef]
73. Monjotin, N.; Amiot, M.J.; Fleurentin, J.; Morel, J.M.; Raynal, S. Clinical Evidence of the Benefits of Phytonutrients in Human Healthcare. *Nutrients* **2022**, *14*, 1712. [CrossRef] [PubMed]
74. Caesar, L.K.; Cech, N.B.; Kubanek, J.; Linington, R.; Luesch, H. Synergy and Antagonism in Natural Product Extracts: When 1 + 1 Does Not Equal 2. *Nat. Prod. Rep.* **2019**, *36*, 869–888. [CrossRef] [PubMed]
75. Vyas, S. Therapeutic and Pharmacological Potential of *Prunus domestica*: A Comprehensive Review. *Int. J. Pharm. Sci. Res.* **2021**, *12*, 3034–3041. [CrossRef]
76. Kovacikova, E.; Kovacik, A.; Halenar, M.; Tokarova, K.; Chrastinova, L.; Ondruska, L.; Jurcik, R.; Kolesar, E.; Valuch, J.; Kolesarova, A. Potential Toxicity of Cyanogenic Glycoside Amygdalin and Bitter Apricot Seed in Rabbits—Health Status Evaluation. *J. Anim. Physiol. Anim. Nutr.* **2019**, *103*, 695–703. [CrossRef]
77. Wani, S.M.; Jan, N.; Wani, T.A.; Ahmad, M.; Masoodi, F.A.; Gani, A. Optimization of Antioxidant Activity and Total Polyphenols of Dried Apricot Fruit Extracts (*Prunus armeniaca* L.) Using Response Surface Methodology. *J. Saudi Soc. Agric. Sci.* **2017**, *16*, 119–126. [CrossRef]
78. Fatima, T.; Bashir, O.; Jan, N.; Scholar, P.; Gani, G.; Bhat, T.A. Nutritional and Health Benefits of Apricots. *Int. J. Unani Integr. Med.* **2018**, *2*, 5–9.
79. Al-Soufi, M.H.; Alshwyeh, H.A.; Alqahtani, H.; Al-Zuwaid, S.K.; Al-Ahmed, F.O.; Al-Abdulaziz, F.T.; Raed, D.; Hellal, K.; Mohd Nani, N.H.; Zubaidi, S.N.; et al. A Review with Updated Perspectives on Nutritional and Therapeutic Benefits of Apricot and the Industrial Application of Its Underutilized Parts. *Molecules* **2022**, *27*, 5016. [CrossRef]
80. Askarpour, M.; Ghalandari, H.; Setayesh, L.; Ghaedi, E. Plum Supplementation and Lipid Profile: A Systematic Review and Meta-Analysis of Randomised Controlled Trials. *J. Nutr. Sci.* **2023**, *12*, e6. [CrossRef]
81. Mullins, A.; Akhavan, N.; Arjmandi, B.; Ormsbee, L. Study Protocol: Effects of Daily Prune Consumption on Lipid Profile, Inflammation, and Oxidative Stress. *Curr. Dev. Nutr.* **2022**, *6*, 1150. [CrossRef]
82. Kitic, D.; Miladinovic, B.; Randjelovic, M.; Szopa, A.; Sharifi-Rad, J.; Calina, D.; Seidel, V. Anticancer Potential and Other Pharmacological Properties of *Prunus armeniaca* L.: An Updated Overview. *Plants* **2022**, *11*, 1885. [CrossRef]
83. Buskaran, K.; Bullo, S.; Hussein, M.Z.; Masarudin, M.J.; Moklas, M.A.M.; Fakurazi, S. Anticancer Molecular Mechanism of Protocatechuic Acid Loaded on Folate Coated Functionalized Graphene Oxide Nanocomposite Delivery System in Human Hepatocellular Carcinoma. *Materials* **2021**, *14*, 817. [CrossRef] [PubMed]
84. El-Beltagi, H.S.; El-Ansary, A.E.; Mostafa, M.A.; Kamel, T.A.; Safwat, G. Evaluation of the Phytochemical, Antioxidant, Antibacterial and Anticancer Activity of *Prunus domestica* Fruit. *Not. Bot. Horti Agrobot. Cluj Napoca* **2019**, *47*, 395–404. [CrossRef]
85. Bahrin, A.A.; Moshawih, S.; Dhaliwal, J.S.; Kanakal, M.M.; Khan, A.; Lee, K.S.; Goh, B.H.; Goh, H.P.; Kifli, N.; Ming, L.C. Cancer Protective Effects of Plums: A Systematic Review. *Biomed. Pharmacother.* **2022**, *146*, 112568. [CrossRef] [PubMed]
86. Hooshmand, S.; Kern, M.; Metti, D.; Shamloufard, P.; Chai, S.C.; Johnson, S.A.; Payton, M.E.; Arjmandi, B.H. The Effect of Two Doses of Dried Plum on Bone Density and Bone Biomarkers in Osteopenic Postmenopausal Women: A Randomized, Controlled Trial. *Osteoporos. Int.* **2016**, *27*, 2271–2279. [CrossRef]
87. Wallace, T.C. Dried Plums, Prunes and Bone Health: A Comprehensive Review. *Nutrients* **2017**, *9*, 401. [CrossRef]
88. Silvan, J.M.; Ciechanowska, A.M.; Martinez-Rodriguez, A.J. Modulation of Antibacterial, Antioxidant, and Anti-Inflammatory Properties by Drying of *Prunus domestica* L. Plum Juice Extracts. *Microorganisms* **2020**, *8*, 119. [CrossRef]
89. Siddiqui, S.A.; Anwar, S.; Yunusa, B.M.; Nayik, G.A.; Mousavi Khaneghah, A. The Potential of Apricot Seed and Oil as Functional Food: Composition, Biological Properties, Health Benefits & Safety. *Food Biosci.* **2023**, *51*, 102336. [CrossRef]

90. Lever, E.; Scott, S.M.; Louis, P.; Emery, P.W.; Whelan, K. The Effect of Prunes on Stool Output, Gut Transit Time and Gastrointestinal Microbiota: A Randomised Controlled Trial. *Clin. Nutr.* **2018**, *38*, 165–173. [CrossRef]
91. Simpson, A.M.R.; De Souza, M.J.; Damani, J.; Rogers, C.; Williams, N.I.; Weaver, C.; Ferruzzi, M.G.; Chadwick-Corbin, S.; Nakatsu, C.H. Prune Supplementation for 12 Months Alters the Gut Microbiome in Postmenopausal Women. *Food Funct.* **2022**, *13*, 12316–12329. [CrossRef]
92. Alasalvar, C.; Chang, S.K.; Kris-Etherton, P.M.; Sullivan, V.K.; Petersen, K.S.; Guasch-Ferré, M.; Jenkins, D.J.A. Dried Fruits: Bioactives, Effects on Gut Microbiota, and Possible Health Benefits—An Update. *Nutrients* **2023**, *15*, 1611. [CrossRef]
93. Mihaylova, D.; Popova, A.; Alexieva, I.; Krastanov, A.; Lante, A. Polyphenols as Suitable Control for Obesity and Diabetes. *Open Biotechnol. J.* **2018**, *12*, 219–228. [CrossRef]
94. Lankatillake, C.; Luo, S.; Flavel, M.; Lenon, G.B.; Gill, H.; Huynh, T.; Dias, D.A. Screening Natural Product Extracts for Potential Enzyme Inhibitors: Protocols, and the Standardisation of the Usage of Blanks in α-Amylase, α-Glucosidase and Lipase Assays. *Plant Methods* **2021**, *17*, 3. [CrossRef] [PubMed]
95. Magiera, A.; Kołodziejczyk-Czepas, J.; Skrobacz, K.; Czerwińska, M.E.; Rutkowska, M.; Prokop, A.; Michel, P.; Olszewska, M.A. Valorisation of the Inhibitory Potential of Fresh and Dried Fruit Extracts of Prunus Spinosa L. towards Carbohydrate Hydrolysing Enzymes, Protein Glycation, Multiple Oxidants and Oxidative Stress-Induced Changes in Human Plasma Constituents. *Pharmaceuticals* **2022**, *15*, 1300. [CrossRef]
96. Marčetić, M.; Samardžić, S.; Ilić, T.; Božić, D.D.; Vidović, B. Phenolic Composition, Antioxidant, Anti-Enzymatic, Antimicrobial and Prebiotic Properties of Prunus Spinosa L. Fruits. *Foods* **2022**, *11*, 3289. [CrossRef]
97. Vahedi-Mazdabadi, Y.; Karimpour-Razkenari, E.; Akbarzadeh, T.; Lotfian, H.; Toushih, M.; Roshanravan, N.; Saeedi, M.; Ostadrahimi, A. Anti-Cholinesterase and Neuroprotective Activities of Sweet and Bitter Apricot Kernels (*Prunus armeniaca* L.). *Iran. J. Pharm. Res.* **2020**, *19*, 216–224. [CrossRef]
98. Ogunlade, A.O.; Oluwafemi, G.I. Production and Evaluation of Jam Produced from Plum and African Star Apple Blends. *J. Homepage* **2021**, *5*, 93–98. [CrossRef]
99. Wu, Z.; Li, X.; Zeng, Y.; Cai, D.; Teng, Z.; Wu, Q.; Sun, J.; Bai, W. Color Stability Enhancement and Antioxidation Improvement of Sanhua Plum Wine under Circulating Ultrasound. *Foods* **2022**, *11*, 2435. [CrossRef] [PubMed]
100. Joshi, V.K.; Gill, A.; Kumar, V.; Chauhan, A. Preparation of Plum Wine with Reduced Alcohol Content: Effect of Must Treatment and Blending with Sand Pear Juice on Physico-Chemical and Sensory Quality. *Indian J. Nat. Prod. Resour.* **2014**, *5*, 67–74.
101. Jarvis, N.; O'Bryan, C.A.; Ricke, S.C.; Crandall, P.G. The Functionality of Plum Ingredients in Meat Products: A Review. *Meat Sci.* **2015**, *102*, 41–48. [CrossRef]
102. Mohammadi-Moghaddam, T.; Firoozzare, A.; Kariminejad, M.; Sorahi, M.; Tavakoli, Z. Black Plum Peel as a Useful By-Product for the Production of New Foods: Chemical, Textural, and Sensory Characteristics of Halva Masghati. *Int. J. Food Prop.* **2020**, *23*, 2005–2019. [CrossRef]
103. Ivanova, D.; Valov, N.; Valova, I.; Stefanova, D. Optimization of Convective Drying of Apricots. *TEM J.* **2017**, *6*, 572–577. [CrossRef]
104. Téllez-Pérez, C.; Cardador-Martínez, A.; Tejada-Ortigoza, V.; Soria-Mejía, M.C.; Balderas-León, I.; Alonzo-Macías, M. Antioxidant Content of Frozen, Convective Air-Dried, Freeze-Dried, and Swell-Dried Chokecherries (*Prunus virginiana* L.). *Molecules* **2020**, *25*, 1190. [CrossRef] [PubMed]
105. Abd, M.; Sorour, E.; Mehanni, A.-H.E.-S.; Mahmoud, S.; Mustafa, H.; Mustafa, A.; Mustafa, M.A.; Hussien, S.M. Chemical Composition and Functional Properties of Some Fruit Seed Kernel Flours. *J. Sohag Agriscience (JSAS)* **2021**, *6*, 184–191.
106. Saadi, S.; Saari, N.; Ariffin, A.A.; Ghazali, H.M.; Hamid, A.A.; Abdulkarim, S.M.; Anwar, F.; Nacer, N.E. Novel Emulsifiers and Stabilizers from Apricot (*Prunus armeniaca* L.): Their Potential Therapeutic Targets and Functional Properties. *Appl. Food Res.* **2022**, *2*, 100085. [CrossRef]
107. Li, Y.; Tang, B.; Chen, J.; Lai, P. Microencapsulation of Plum *(Prunus salicina* Lindl.) Phenolics by Spray Drying Technology and Storage Stability. *Food Sci. Technol.* **2017**, *38*, 530–536. [CrossRef]
108. Nizioł-Łukaszewska, Z. Extracts of Cherry and Sweet Cherry Fruit as Active Ingredients of Body Wash Formulations. *Not. Bot. Horti Agrobot. Cluj Napoca* **2019**, *47*, 100–107. [CrossRef]
109. Pham, T.T.; Le, L.; Nguyen, P.; Dam, M.S.; Baranyai, L. Application of Edible Coating in Extension of Fruit Shelf Life: Review. *AgriEngineering* **2023**, *5*, 520–536. [CrossRef]
110. Stryjecka, M.; Kiełtyka-Dadasiewicz, A.; Michalak, M.; Rachoń, L.; Głowacka, A. Chemical Composition and Antioxidant Properties of Oils from the Seeds of Five Apricot (*Prunus armeniaca* L.) Cultivars. *J. Oleo Sci.* **2019**, *68*, 729–738. [CrossRef]
111. Nafis, A.; Kasrati, A.; Jamali, C.A.; Custódio, L.; Vitalini, S.; Iriti, M.; Hassani, L. A Comparative Study of the in Vitro Antimicrobial and Synergistic Effect of Essential Oils from *Laurus nobilis* L. and *Prunus armeniaca* L. from Morocco with Antimicrobial Drugs: New Approach for Health Promoting Products. *Antibiotics* **2020**, *9*, 140. [CrossRef]
112. Makrygiannis, I.; Athanasiadis, V.; Bozinou, E.; Chatzimitakos, T.; Makris, D.P.; Lalas, S.I. An Investigation into Apricot Pulp Waste as a Source of Antioxidant Polyphenols and Carotenoid Pigments. *Biomass* **2022**, *2*, 334–347. [CrossRef]
113. Soares Mateus, A.R.; Pena, A.; Sendón, R.; Almeida, C.; Nieto, G.A.; Khwaldia, K.; Sanches Silva, A. By-Products of Dates, Cherries, Plums and Artichokes: A Source of Valuable Bioactive Compounds. *Trends Food Sci. Technol.* **2023**, *131*, 220–243. [CrossRef]

114. Vorobyova, V.; Skiba, M. Apricot pomace extract as a natural corrosion inhibitor of mild steel corrosion in 0.5 m nacl solution: A combined experimental and theoretical approach. *J. Chem. Technol. Metall.* **2020**, *55*, 210–222.
115. Dawson, I.K.; Attwood, S.J.; Park, S.E.; Jamnadass, R.; Powell, W.; Sunderland, T.; Kindt, R.; Mcmullin, S.; Hoebe, P.N.; Baddeley, J.; et al. *Contributions of Biodiversity to the Sustainable Intensification of Food Production–Thematic Study for The State of the World's Biodiversity for Food and Agriculture*; Food and Agriculture Organization: Rome, Italy, 2019; Volume 161.
116. Li, M.; Xiao, Y.; Mount, S.; Liu, Z. An Atlas of Genomic Resources for Studying Rosaceae Fruits and Ornamentals. *Front. Plant Sci.* **2021**, *12*, 397. [CrossRef] [PubMed]
117. Chen, F.; Song, Y.; Li, X.; Chen, J.; Mo, L.; Zhang, X.; Lin, Z.; Zhang, L. Genome Sequences of Horticultural Plants: Past, Present, and Future. *Hortic. Res.* **2019**, *6*, 112. [CrossRef]
118. Maria Sirangelo, T. Sensory Descriptive Evaluation of Food Products: A Review Citation: Tiziana Maria Sirangelo. Sensory Descriptive Evaluation of Food Products: A Review. *J. Food Sci. Nutr. Res.* **2019**, *2*, 354–363. [CrossRef]
119. Palka, A.; Skotnicka, M. The Health-Promoting and Sensory Properties of Tropical Fruit Sorbets with Inulin. *Molecules* **2022**, *27*, 4239. [CrossRef]
120. Belli, S.; Chang, C.-L.; Malusà, E.; Furmanczyk, E.M.; Tartanus, M.; Brouwer, G.; Parveaud, C.-E.; Warlop, F.; Kelderer, M.; Kienzle, J.; et al. Knowledge Networks in Organic Fruit Production across Europe: A Survey Study. *Sustainability* **2022**, *14*, 2960. [CrossRef]