



A review of the most important natural antioxidants and effective medicinal plants in traditional medicine on prostate cancer and its disorders

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ABSTRACT

Herbal plants can be used to treat and prevent life-threatening diseases, such as prostate cancer, infections and other diseases. The findings from traditional medicine and the use of medicinal plants can help control and treat most problems due to prostate diseases. The aim of this study was to identify and report the most important medicinal plants that affect prostate disorders. Based on the results of the review of numerous articles indexed in the databases ISI, Scopus, PubMed, Google Scholar, etc., a number of plants have been reported to be used in the treatment and prevention of diseases, inflammation, infection, and cancer of the prostate gland. The plants include *Panax ginseng*, *Arum palaestinum*, *Melissa officinalis*, *Syzygium paniculatum*, *Coptis chinensis*, *Embelia ribes*, *Scutellaria baicalensis*, *Tripterygium wilfordii*, *Salvia triloba*, *Ocimum tenuiflorum*, *Psidium guajava*, *Ganoderma lucidum*, *Litchi chinensis*, *Saussurea costus*, *Andrographis paniculata*, *Magnolia officinalis* and *Prunus africana*. Phytochemical investigations have examined the therapeutic effects of medicinal plants effective on prostate cancer and their possible mechanisms of action and clinical effects as well as the use of active flavonoids in production of herbal drugs. Due to the active ingredients and important flavonoids of these plants, they can be used in production of herbal drugs that prevent and treat infections, inflammation and cancer of the prostate gland, and reduce the metastasis of prostate cancer cells, reducing the patients' suffering and pain.

Implication for health policy/practice/research/medical education:

Medicinal plants presented in this review might be used effectively for some prostate disorders. Cautious about drug interaction and side effects of medicinal plants is very important.

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Introduction

The prostate gland, as age increases, may be affected by many diseases, including benign prostatic hyperplasia (BPH) and prostate cancer, due to impaired normal growth of the gland (1). Prostate cancer is a condition in which malignant cells originate in prostate tissues and irregularly proliferate, resulting in an increase in volume of each of the cellular components of the prostate gland (2,3). Prostate cancer is one of the most common cancers and the second leading cause of cancer deaths in men (4,5). Although prostate cancer is more common in older men, studies have shown that one third of men in the 30's and

40's have histological evidence of prostate adenocarcinoma (6). The formation of a tumor in the prostate is related to several factors such as age, race, diet, heredity, and the environment (7). In addition, inflammation is also a major contributor to prostate diseases and may play a role in the growth of tumor cells. Prostate cancer seems to be partly related to genetics, but environmental factors are also involved (8,9). Prostate diseases have adverse effects on fertility and also cause urinary problems due to the anatomical condition of the prostate (10,11). Prostatitis is classified as acute, chronic, asymptomatic inflammatory (chronic pelvic pain syndrome), and chronic bacterial.

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Prostatitis may develop at any ages (12,13). Several studies in different countries have confirmed the beneficial effects of herbal therapy on prostate cancer and other diseases (14). In developed countries, prostate cancer is the second leading cancer in men, so that one out of every six men develops the cancer (15). With the increasing prevalence of prostate cancer deaths and the inefficacy of chemotherapy and radiation therapy in advanced forms of this cancer, new methods are needed to control this cancer (16). BPH is the fourth leading disease in men over the age of 50 (17). As the age advances, the prevalence of BPH increases (18-22). Most of the plants' properties are related to antioxidant activity (23), which is mainly due to the presence of phenolic compounds (24). However, other compounds are likely to be involved in the plants' activities. Nettle is known to exhibit positive effect on the treatment of BPH (25). The main activity of nettle seems to be exerted by disrupting dihydrotestosterone binding to cytosol and nuclear receptors (26), explaining the role of the plant in preventing prostate cancer. A recent study showed that 20% extract of the nettle had specific anti-proliferative effects on the epithelial and stromal cells of the prostate (27,28). There is a compound in the garlic that has been reported to inhibit the growth of prostate cancer cells in vitro. Garlic can counteract cancer causing agents. In garlic, the compound S-allyl cysteine has high antitumor properties, thus converting remaining testosterone products into low-risk materials (29-31). A review study has shown that *Allium* can effectively inhibit proliferation of the LNCaP prostate cancer cells (32). Green tea can have inhibitory effects on prostate cancer. Studies on rats have shown that green tea is able to inhibit the enzyme 5-alpha reductase. This enzyme is a conversion factor of testosterone to dihydrotestosterone, which is a carcinogenic agent in the prostate (33). Researchers have found that the strongest of these compounds in the green tea is epigallocatechin-3-gallate (34). Epigallocatechin-3-gallate and other green tea compounds inhibit the activity of an enzyme called proteasome. Proteasome is a key factor in the development of prostate cancer (35). Studies have shown that curcumin blocks the growth of the prostate cancer cell by inhibiting the activity of the enzyme tyrosine kinase in the epidermal growth factor receptor (36). One study demonstrated that curcumin is effective in treating androgen dependent prostate cancer (37). In a recent study, curcumin was observed to inhibit prostate cancer cells, and completed this action by blocking the effects of factors called AP-6 and NF-KappaB (38). A study on animal tissue reported evidence for the positive effect of the *Pygeum africanum* extract on inflammation involved in the development of BPH (39). A clinical study has shown that *P. africanum* can improve enlarged prostate gland and prevent development of incidental prostate cancer (40-42). A study suggested that the therapeutic and preventive effects of hydroalcoholic

extract of *Thymus vulgaris* on precancerous lesions and squamous cell carcinoma of the prostate gland observed in Wistar rats can be attributed to thymol and carvacrol. Flavonoids are other compounds in the hydroalcoholic extract of *Thymus vulgaris* which have anti-cancer effects (43). The aim of this study was to identify and report the most important medicinal plants that affect prostate disorder.

Materials and Methods

The information used in this review was obtained from the articles indexed in the databases Iran Medex, Irandoc, PubMed, Scopus, Web of Science, Scientific Information Database, Google Scholar, Magiran, etc. using the search terms prostate cancer, prostate inflammation and diseases, prostatitis, medicinal plants, medicinal plants effective on prostate cancer, medicinal plants effective on prostate inflammation and prostatitis, mechanism of action of medicinal plants effective on prostate cancer, and antioxidant and anticancer effects of extracts and essential oils of medicinal plants effective on prostate diseases. In this study, 165 articles were reviewed. After the initial review, 80 articles were found to address the subject of our review. Irrelevant articles were also excluded. Finally, 80 articles related to the purpose of our review published by 2019 were included in the final analysis.

Results

The medicinal plants and their natural antioxidants, which we examined in this study, effectively influence the treatment and prevention of prostate diseases and cancer and prostatitis via the potential mechanisms reported (Table 1). Based on the results of a review of numerous articles, some of the most important plants for the treatment and prevention of prostate cancer, and infections and inflammation of the prostate gland include *Panax ginseng* (Asian ginseng), *Arum palaestinum* (black calla), *Melissa officinalis* (common balm), *Syzygium paniculatum* (magenta cherry), *Coptis chinensis* (magenta lilly pilly), *Embelia ribes* (false black pepper), *Scutellaria baicalensis* (Baikal skullcap), *Tripterygium wilfordii* (thunder god vine), *Salvia triloba* (Greek sage), *Ocimum tenuiflorum* (holy basil), *Psidium guajava* (common guava), *Ganoderma lucidum* (mushroom), *Litchi chinensis* (Lychee), *Saussurea costus* (costus), *Andrographis paniculata* (green chiretta), *Magnolia officinalis* (houpu magnolia) and *Prunus Africana* (African cherry). The supplementary information and detailed therapeutic action mechanisms of medicinal plants are shown in Table 1.

The most important active ingredients and important flavonoids in these plants include saponins, lignans, coumarins, flavones, phenolic compounds, Damarane-type saponin, quercetin, total flavonoids and phenolics, isoquercitrin, flavan-3-ol, cyanidin-

Table 1. The mechanisms of antioxidant and anticancer actions of the most important medicinal plants effective on prostate diseases and prostate cancer

Scientific name	Family name	Part of plant	Common name	Study model	The mechanisms of antioxidant and anticancer actions of the most important medicinal plants effective on prostate diseases and prostate cancer	Ref.
<i>Panax ginseng</i>	Araliaceae	Root	Ginseng	Rat	The group treated with <i>P. ginseng</i> showed significantly lesser prostate size and weight than the testosterone-induced BPH group. In addition, <i>P. ginseng</i> decreased the mRNA expression of Adra1d as well as the expression of EGFR and BCL2 in prostate tissue.	(44)
<i>Arum palaestinum</i>	Araceae	Root-leaf	Black calla	Mice	The aqueous extract of the root and leaf of this plant is used at a dose of 1000 mg/kg body weight and activates caspase 6 and suppresses the tumor. This caspase is an important marker for prostate cancer.	(45)
<i>Androsace</i>	Primulaceae	Aerial part	rockjasmine	Rat	The flavonoids isolated from this plant, oleanane-type triterpene saponin, increase cytotoxicity and alter the morphology of the cell as well as the sub-G0/G1 phase, leading to an increase in apoptosis in prostate cancer cells and other cancerous tissues. It also induces the death of autophagy of the cell by converting LC3B-I to LC3B-II and producing autophagy vaccines. Flavonoids in this plant also inhibit PI3K, Akt, mTOR, and inhibit migration and invasion of cells.	(46)
<i>Melissa officinalis</i>	Lamiaceae	Leaves	Lemon balm	Human	Polyphenols of hydroalcoholic extract of this plant are used in the treatment of prostate cancer of 100 µg/mL. Extract of this plant inhibits the expression of Boc2, Her2, VEGF-A and hTERT oncogenes in prostate cancer. Expression of her2 acts as a mitochondria (PI3K dependent activation of AKT).	(47)
<i>Artemisia</i>	Asteraceae	Aerial part and root	Wormwood	Human	Scoparone is a coumarin present in the extract of this plant. It is an anti-inflammatory compound that carries NF-κB transcription, and the extract of this plant at a concentration of 41.3 µmol/L at this concentration causes a stop in the G1 phase of the cell cycle and Prevents proliferation of prostate cancer cells, suppressed IL-6-stimulated STAT3 transcriptional activity Controls the transcriptional activity of NF-κB stimulated by TNF-α. The expression of mRNA reduces the STAT3 genes.	(48)
<i>Geissospermum</i>	Apocynaceae	Stem crust	Dogbane	Human	Extract from this skin of p21, p27 and PCNA, Cyclin A and Cyclin D1 inhibitors. At a concentration of 125 µg / mL, G1 stops cell cycle and apoptosis. The extract of this plant induces high preapoptotic BAX regulation and decreases the expression of Bcl-2, Bcl-xL, and XIAP anti-apoptotic expressions. Immigration and invasion of prostate cancer cells block and inhibit the phosphorylation of AKT and NFκB / p65 and the activity of NFκB DNA binding, and TNFα inhibits NFκB/p65 placement into the nucleus, transcribes it, and inhibits MMP9 activity. NFκB/p65 involved in the proliferation of Cyclin D1),), survival (Bcl-2, Bcl-xL, and XIAP), and metastasis (VEGFα, MMP9, and GROα/ CXCL1).	(49)
<i>Syzygium paniculatum</i>	Myrtaceae	Aerial part	Magenta cherry	Human	Flavonoid Tuberimoside-1 (TBMS1), a triterpenoid saponin is extracted from this plant, and at concentrations (5-100 µmol/L) induces apoptosis and stops in the G0 and G1 phases. This family of compounds activates the stress-activated MAPK proteins and induces apoptosis signal-regulating kinase 1 (ASK-1) phosphorylation and induces apoptosis due to oxidative stress.	(50)
<i>Acanthopanax</i>	Araliaceae	Leaves and stems	Eleutherococcus.	Human	Ethyl acetate extracts of this plant suppress the NFKB transcription activity and increase the amount of caspase 3 and increase the amount of phospho-Erk1/2 and phospho-Akt. (80 µg/mL) from the leaf and stem of this extract plant.	(51)
<i>Coptis chinensis</i>	Ranunculaceae	Rhizome	Chinese goldthread	Human	The compound in the rhizome (the stems of the underground) is called Berberine, which is used at various concentrations of 20-100-200 µM. At a concentration of 20-100 µM, it reduces the proliferation of cancer cells and at a concentration of 20 µM survival decreases. At a concentration of 100 µM, it causes cellular stagnation in the G1 phase and a decrease in the G2/m phase, and increases apoptosis and decreases expression of the PSA. It inhibits EGFR activation and reduces the expression and activation of EGF-induced EGF.	(52)
<i>Embelia ribes</i>	Primulaceae	Fruit and stems	White-flowered embelia	Human	The combination of this plant Embelin, which inhibits the X-linked inhibitor of apoptosis protein (XIAP), induces apoptosis by TNFα and the TNF-associated apoptosis-inducing ligand (TRAIL). At a concentration of 10-20 µM, it causes a stop in the S-cycle of the cell cycle, and it can also stop in the G2/M phase and stimulate Caspase 3 activity.	(53)

Table 1. Continued

Scientific name	Family name	Part of plant	Common name	Study model	The mechanisms of antioxidant and anticancer actions of the most important medicinal plants effective on prostate diseases and prostate cancer	Ref.
<i>Scutellaria baicalensis</i>	Lamiaceae	Root	Baikal skullcap	Human	In concentration 200 mg/kg aqueous extract of the plant has effects on cell proliferation, cyclooxygenase 2, decreased prostaglandin E2, and cyclins / cdk pathway, decreasing PSA. It decreases the expression of cyclin D1 and causes stopping in G1 phase and CDK1 inhibitors and kinase activity Causing G 2/M to stop.	(54)
<i>Tripterygium wilfordii</i>	Celastraceae	Root crust	Thunder god vine	Human	The root skin of this plant has antitumor activity and decreases the survival of prostate cancer cells, both in dependent and non-androgenic androgens, and suppresses migration and invasion in a non-toxic dose of less than 1 μ M and proliferation at 0.5 μ M. This combination also induces apoptosis (sub-G1 population increase) and Mcl-1 modulation and induction of stopping in the G2/M phase, increases the activity of caspase enzymes 3-9m, blocking the activity of NF-kb and cytosolic Ikb α degeneration he does.	(53)
<i>Salvia triloba</i>	Lamiaceae	Whole plant	Greek sage	Human	At 50, 100 μ g/mL concentrations, the entire methanol extract of the plant reduces the survival of prostate cancer cells and increases the rate of death and apoptosis of prostate cancer cells. This plant contains compounds of 1.8-cineole, β -pinene, β -caryophyllene, camphor, and stimulates the fragmentation of DNA and Caspase 3/7 activity by concentration-dependent method and inhibits the mobility of cancer cells. The flavonoids of this plant reduce the angiogenic cytokines such as GRO, IL- 6, IL-8, IFN- γ , PIGF, TIMP-1, Thrombopoietin Angiogenin, PDGF-BB, MCP-1, LEPTIN, RANTES and TIMP-2, VEGF-D, thereby eliminating cells Cancer is effective.	(55)
<i>Ocimum tenuiflorum</i>	Lamiaceae	Leaves	tulasi	Human	Leaf ethanolic extract (25, 50 and 100 μ g/mL) reduces the survival of cancer cells and also increases the level of caspase-9 and caspase-3 reduction of Bcl-2, increasing the cleaved PARP in the concentration-dependent manner.	(56)
<i>Psidium guajava</i>	Myrtaceae	Leaves	Lemon guava	Human	The methanolic extract of this plant, including triterpenoids, flavonoids, essential oil, and tannins, suppresses PI3K/AKT/mTOR/S6K1 and mitogen-activated protein kinases (MAPKs), also lowers the levels of proteins involved in cell proliferation, Anti-apoptotic and metastatic, at a concentration of 50 μ g/mL, has cytotoxicity and induces cell death, and reduces cell survival by stopping the sub-G1 phase cell cycle. At concentrations of 100-150 μ g/mL, fractionation of procaspase-9 and PARP and induction of procaspase-3-8 result. It also suppresses cell cycle protein (cyclin D1) and proteins associated with metastases and angiogenesis of COX-2 and VEGF, and it inhibits nitric oxide synthase and produces COX-2 through low levels of NFkB, as well as ERK and JNK phosphorylation and Suppresses p38.	(57)
<i>Fraxinus</i>	Oleaceae	Whole plant	Ash	Human	The compound in this plant is nummularic acid, which is a triterpenoid. 20 μ M and 40 μ M is anticologenic and antiproliferative, causes apoptosis and induces PARP and partition of caspase 3, also induces phosphorylation of Thr172 in the alpha AMPK subunit and also reduces mTORC1.	(58)
<i>Ganoderma lucidum</i>	Ganodermataceae	Whole plant	Ganoderma.	Human	At concentrations (0.5-2.5 mg/mL) from the plant's extract, it can inhibit invasive prostate cancer by decreasing the expression of NF-kappaB, the activator of plasminogen yero kinase (uPA) and uPA receptor. Meanwhile, G. lucidum (0.125-0.5 mg/mL) can cause apoptosis, inhibit cell proliferation and suppress the migration of highly invasive PK-3 cancer cells, as well as angiogenesis-dependent prostate cancer with MAPK and Akt signaling modulation Controlling PC-3 cells The results showed that G. lucidum had the efficacy of clinical treatment for the treatment of prostate cancer.	(59)

Table 1. Continued

Scientific name	Family name	Part of plant	Common name	Study model	The mechanisms of antioxidant and anticancer actions of the most important medicinal plants effective on prostate diseases and prostate cancer	Ref.
<i>Litchi chinensis</i>	Sapindaceae	Seed	Lychee	Human	Seed extract of this plant has different drug effects, including significant cellular and clonogenic cellular and cellular survival of prostate cancer PC-3, DU145, RM-1 and C4-2B by dose-dependent method (31-25 g/mL) and induction of cell apoptosis and end-of-cycle cycles Cells in the G1 / S phase by disabling the signaling pathway of the protein kinase B (Akt or PKB), in addition, the extracts significantly reduce cell migration and invasion by reducing the phenotypic change of the epithelial prostate mesenchymal cancer.	(60)
<i>Saussurea costus</i>	Asteraceae	Aerial part	Costus	Human	Hexane extracts of this plant inhibit proliferation inducing epidermal growth factor (EGF) induction of prostate cancer metastases DU145 and TRAMP-C2 in a dose-dependent manner (1-4 g/mL), while not affecting the survival of a cancer cell. In addition, the extract of this plant reduced the metalloproteinase (MMP)-9 matrix and the metalloproteinase secretion inhibitor (TIMP-1), but the level of TIMP-2 increased in the absence or presence of EGF. The results showed that hexane extracts <i>S. lappa</i> may be used as anti-metastases for the treatment of prostate cancer.	(59)
<i>Andrographis paniculata</i>	Acanthaceae	Whole plant	Andrographis	Human	Flavonoids derived from this plant, called diterpenoid lactone (1-20 μ M), which can inhibit IL-6-induced signaling in an animal model, inducing a transducer of transcriptional activator and transcription (STAT3) and extracellular signal phosphorylation Regulator (ERK). At the same time, it can prevent the survival of cells and inducing apoptosis of cancer cells of the prostate cancer PC3 and DU145.	(59)
<i>Magnolia officinalis</i>	Magnoliaceae	Leaves	Houpu magnolia	Human	Honokiol is a compound that is available in this plant and is dosed (20-60 μ M). It reduces the survival of PC-3 and LNCaP human prostate cancer cells by stopping the G0/G1 cell cycle and inducing apoptosis (5-20 μ M) in PCa cells by activating 9/3.8, and polymorphizes poly-adenosine diphosphate ribose and also leads to ROS-mediated cytoprotective autophagy.	(59)
<i>Prunus africana</i>	Rosaceae	Leaf	<i>Prunus africana</i>	Human	The most important ingredient in this plant is pentacyclic triterpenoid, which prevents the survival and proliferation of prostate cancer cells by inducing apoptosis and interacting with the microenvironment of the tumor through multiple modulation of signal transmission pathways. This combination prevents cell survival and proliferation and Promoting cell apoptosis and stopping the cell cycle in the G0 / G1 phase in prostate cancer. Its anticancer effects are as a result of kinase (PI3K) phosphoinositide 3- and protein kinase B (Akt) pathway suppression and induces antitumor activity by interfering with the metabolic pathway in cancer cells through the activation of the 5-AMP (AMPK) enzyme -activated protein kinase. Atraric acid is a significant phenolic and sterile compound in this plant that has potent anti-androgenic activity that decreases the proliferation of cancer cells (prostate) and affects androgenic receptors.	(60)

3-glucoside, hypoglycin A, 2,6-dimethoxyphenol, syringol, 2-methoxyphenol, guaiaicol, 3,5-dimethoxy-4-hydroxytoluene, baicalin, wogonin, norwogonin, oroxylin A, β -sitosterol, apigenin, luteolin, quercetin-3-O- β -

glucoside, daucosterol, 2,6-dimethoxy-1,4-benzoquinone. The supplementary information and detailed the most important active ingredients and important flavonoids of medicinal plants are shown in Table 2.

Table 2. Effective bioactive compounds of the herbal plants

Scientific name	Effective material	Ref.
<i>Panax ginseng</i>	5, 7-Dihydroxy-8-methoxyl flavone, ginsenoside Rs2, quinquenoside R1, ginsenoside Rs1, notoginsenoside Fe, ginsenoside Rd2, gypenosiden IX, saponin	(45)
<i>Arum palaestinum</i>	sovanillin, linolenic acid, β -sitosterol, apigenin, luteolin, quercetin, quercetin-3-O- β -glucoside, vitexin, isoorientin, esculin, caffeic, ferulic acids	(45)
<i>Androsace</i>	Saponin, kaempferol 3-O-(3-O-acetyl)- α -L-rhamnopyranoside, kaempferol 3-O-(2-O-acetyl)- α -L-rhamnopyranoside, kaempferol 7-O- α -L-rhamnopyranoside, kaempferol 3-O- α -L-rhamnopyranoside, kaempferol 3-O-beta-D-glucopyranoside, kaempferol 3-O-(3-O-acetyl)- α -L-rhamnopyranosyl-7-O- α -L-rhamnopyranoside, kaempferol 3-O-(4-O-acetyl)- α -L-rhamnopyranosyl-7-O- α -L-rhamnopyranoside, quercetin 3-O- α -L-rhamnopyranoside, quercetin 3-O-beta-D-glucopyranoside, myricetin 3-O-beta-D-glucopyranoside	(46)
<i>Melissa officinalis</i>	Alpha-pinene, borneol, camphene, camphor, verbenone, bornyl-acetate.	(47)
<i>Artemisia annua</i>	Germacrene D, β -pinene, γ -humulene, d-galacturonic acid, d-galactose, d-xylose .	(48)
<i>Geissospermum</i>	Alkaloids O-demethylaspidospermine, flavopereirine, alkaloid geissoschizoline, geissoschizoline N(4)-oxide, 1,2-dehydrogeissoschizoline	(49)
<i>Syzygium paniculatum</i>	α -Pinene, n-hexadecanoic acid, limonene, farnesol, β -ocimene, citronellol, linoleic acid, octahydro-1,4-dimethyl azulene, citral, phytol, linolenic acid, thymol	(50)
<i>Acanthopanax</i>	Triterpenoid saponins, lignans, coumarins, flavones, phenolic compounds, acantrifoic acid C, acantrifoic acid D, triterpenoids	(51)
<i>Coptis chinensis</i>	8,9-dihydroxy-1,5,6, 10b-tetrahydro-2H-pyrrolo[2,1 - α] isoquinolin-3-one,(+/-) -5,5'-dimethoxy-lariciresinol,3,4-dihydroxy-phenylethylalcohol, methyl-5-O-feruloylquininate, ethyl-5-O- feruloylquininate, apocynol.	(52)
<i>Embelia ribes</i>	Quinones, alkaloids, terpenoids, steroids, flavones	(53)
<i>Scutellaria baicalensis</i>	baicalein, baicalin, wogonin, norwogonin, oroxylin A, β -sitosterol	(54)
<i>Tripterygium wilfordii</i>	Alkaloids, Celastrol, pentacyclic triterpenoid, triptolide, a diterpene triepoxide	(53)
<i>Salvia fruticosa</i>	1,8 - cineole, β -pinene, β -caryophyllene, camphor, flavonoids hispidulin, salvigenin and cirsimaritin, carnolic acid, carnosol, 12-methoxycarnosic acid.	(55)
<i>Ocimum tenuiflorum</i>	Oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, β -caryophyllene, essential oil, eugenol, β -elemene, β -caryophyllene, germacrene, terpenes.	(56)
<i>Psidium guajava</i>	Triterpenoids, flavonoids, essential oil, and tannins, morin-3-O-lyxoside, morin-3-O-arabioside, quercetin and quercetin-3-O-arabioside.	(57)
<i>Fraxinus spp.</i>	Nummularic acid, 8- hydroxy-12-oxoabieta-9,13-dien-20-oic, 20-lactone, 6beta-hydroxyfcruginol, pisiferic acid, pisiferal(4),(+)-7-dehydroabietnone, 1-oxomiltirone, subdigitatone, linarionoside B,(3R,9R)-3-hydroxy-7,8-dihydro-beta-ionol 9-O-beta-D-apiofuranosyl-(1-->6)-beta-D-glucopyranoside, ursolic acid, betulinic acid, euscaphic acid, syringaresinol, fraxiresinol, (1-hydroxysyringaresinol, pinoresinol, medioresinol, 8-acetoxypinoresinol, epipinoresinol, (+)-1-hydroxypinoresinol 4"-O-beta-D-glucopyranoside,(+)-syringaresinol O-beta-D-glucopyranoside, liriiodendrin, ehletianol D, icaraside E5(29) (-)-(7R, 8R)-threo-1-C-syringylglycerol, sin apyladehyde(38), trans-p-hydroxycinnamaldehyde, syringic acid, vanilic acid, vanillin, 4-hydroxy-benzaldehyde, (24R)-24-ethyl-5alpha-cholestane-3beta,5,6beta-triol, beta-sitosterol, daucosterol, 2,6-dimethoxy-1,4-benzoquinone.	(58)
<i>Ganoderma lucidum</i>	Steroid hormones, polysaccharides, beta-glucan, coumarin, mannitol, alkaloids. Sterols ganoderol, ganoderenic acid, ganoderiol, ganodermanontriol, lucidadiol, ganodermediol.	(59)
<i>Litchi chinensis</i>	Polyphenols, flavan-3-ol, cyanidin-3-glucoside, hypoglycin A, 2,6-dimethoxyphenol, syringol, 2-methoxyphenol, guaiaicol, 3,5-dimethoxy-4-hydroxytoluene	(59)
<i>Saussurea costus</i>	Costunolide, dehydrocostus lactone, scopoletin, α -linolenic acid	(59)
<i>Andrographis paniculata</i>	diterpenoid lactone, 14-Deoxy-11-dehydroandrographolide, 5-Hydroxy-7,8,2',3'-tetramethoxyflavone, andrographine, andrographolide, neoandrographolide, panicoline, paniculide-A, paniculide-B, paniculide-C	(59)
<i>Magnolia officinalis</i>	magnolol, honokiol, saponins, lignans, coumarins, flavones, phenolic compounds.	(59)
<i>Prunus africana</i>	pentacyclic triterpenoid, magnoloside B, magnoloside A, magnoloside F, magnolol, obvatol and honokiol.	(60)

Discussion

Due to the numerous complications of anticancer drugs and chemotherapy such as dizziness, headache, weakness, tachycardia, hypotension and high cost of treatment with anti-prostate cancer drugs, most people today tend to use plant products. The therapeutic effects of many medicinal plants in many diseases and cancers have been proven (61-63), among which *Panax ginseng*, *Arum palaestinum*, *Androsace*, *Melissa officinalis*, *Artemisia*, *Geissospermum*, *Syzygium paniculatum*, *Acanthopanax*, *Coptis chinensis*, *Embelia ribes*, *Scutellaria baicalensis*, *Tripterygium wilfordii*, *Salvia fruticosa*, *Ocimum tenuiflorum*, *Psidium guajava*, *Fraxinus*, *Ganoderma lucidum*, *Litchi chinensis*, *Saussurea costus*, *Andrographis paniculata*, *Magnolia officinalis*, *Prunus africana* have the greatest impact on prostate diseases.

A variety of vitamins and antioxidant substances also play a significant role in improving prostate function and are used in many natural products to control prostate problems. Anticancer, antioxidant compounds in the diet, such as tocopherols and carotenoids, have been proven in many clinical trials and published. Antioxidants can stimulate the immune system to locate the tumor and destroy its cells or inhibit angiogenesis. It also causes a widespread expression of the p53 gene, which is a suppressor of tumor cells. According to studies, consumption of herbs effective in treating prostate diseases plays an important part in treating the diseases due to fewer side effects and antioxidant and regulator effects. It seems that the herbal products of interest can be effective in controlling the abnormal growth of precancerous lesions and prostate carcinoma (64-69). Medicinal plants with herbal antioxidants and active ingredients have their effects on the treatment of diseases (70-72). In this review article, potent biologically active antioxidant compounds from natural sources and medicinal plants with substantial medical and pharmaceutical effects in the treatment of prostate diseases and cancer were discussed. The results of the phytochemical studies have indicated the antioxidant, anticancer and antimicrobial properties of the above-mentioned medicinal plants may be due to biologically active compounds and active flavonoids, such as the active ingredients saponins, lignans, coumarins, phenolic compounds, Dammarane-type saponin, flavones, quercetin, total flavonoids and phenolics, flavan-3-ol, cyanidin-3-glucoside, isoquercitrin, hypoglycin A, 2,6-dimethoxyphenol, syringol, 2-methoxyphenol, baicalin, wogonin, guaiacol, 3,5-dimethoxy-4-hydroxytoluene, norwogonin, oroxylin A, β -sitosterol, quercetin-3-O- β -glucoside, daucosterol, apigenin, luteolin and 2,6-dimethoxy-1,4-benzoquinone. This review highlights some of therapeutic methods and medicinal plants recommended by traditional medicine across the world that have anticancer effect and are effective on prostate diseases and cancer.

The present study sought to introduce the mechanism and the effect of some common herbal drugs with special antioxidant effects, so that they can be used as preventive and therapeutic drug supplements in prostate diseases and tumors in humans. The medicinal plants can also be used to deliver pharmaceutical supplements in medicine due to the presence of antioxidant compounds, biologically active compounds, flavonoids, etc.

Authors' contributions

SA prepared the manuscript while GHB and MSH edited the manuscript. All authors reviewed, commented and approved the final draft.

Conflict of interests

The authors have no conflict of interests to declare regarding the publication of this paper.

Ethical considerations

Ethical issues have been observed by the authors.

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