# REVIEW ON SAW PALMETTO: A NATURAL HAIR SUPPLEMENT

**[1]Ms. Varsha Mohanrao Madpatte, [2]Mrs. Anjali Mali, [3]Dr. Gajanan Sanap**

[1]Student of Pharmacy, [2]Assistant Professor, [3]Principal
[1]Department of Pharmacy,
[1]Late Bhagirathi Yashwantrao Pathrikar College of Pharmacy, Pathri, Aurangabad, 431001, Maharashtra, India

***Abstract:*** Saw palmetto (SP), a botanical extract with antiandrogenic properties, has received industrial recognition for its purported benefits on hair regrowth. saw palmetto, a plant that determined its use already withinside the 19th century. Nowadays, it is still utilized in medicine, pharmacy and cosmetology. Serenoa extract is a potent 5-AR inhibitor, the usage of which reduces the destructive DHT level. Saw palmetto additionally influences the inhibition of testosterone and DHT binding to cytoplasmic and nuclear androgen receptors. The already referred to 5α-dihydrotestosterone (DHT) is one of the reasons of androgenic alopecia. Alopecia in each males and females is one of the maximum significant aesthetic troubles of modern times. Saw palmetto (SP), a botanical extract with antiandrogenic properties, has gained industrial reputation for its purported advantages on hair regrowth. To summarize posted proof at the efficacy, safety, and tolerability of dietary supplements containing SP withinside the treatment of alopecia, we carried out a PubMed, Google Scholar, and Cochrane database search using the subsequent terms: (saw palmetto and hair loss), (saw palmetto and androgenetic alopecia), and (saw palmetto and herbal supplement and alopecia). Five randomized medical trials (RCTs) and 2 potential cohort research established tremendous outcomes of topical and oral dietary supplements containing SP (100–320 mg) amongst patients with androgenetic alopecia (AGA) and telogen effluvium. Sixty percent development in general hair quality, 27% development in general haircount, multiplied hair density in 83.3% of patients, and stabilized disease development amongst 52% have been noted with use of diverse topical and oral SP-containing supplements.

***Keywords*** **– Saw palmetto, Hepatocellular carcinoma, Hair supplement, Serenoa repens, Hair loss treatment, etc.**

## I. INTRODUCTION

Saw palmetto (SP) is a botanical extract from the berries of the Serenoa repens dwarf tree, local to the subtropical, Southeastern United States [1]. The extract may be organized as liquid thru warm water or supercritical elicitation with carbon dioxide, or as powder thru mechanical grinding of raw berries [2]. Due to its antiandrogenic effects, SP has been used as an opportunity treatment for benign prostatic hyperplasia (BPH) [3–5], dating lower back to the 15th century BCE, Egypt [5]. SP extract is in most cases made from fatty acids (70–95%) [6], phytosterols including β-sitosterol (0.1%) [6], β-carotene, nutrition E derivatives, and polysaccharides however, the exact ratios can range depending at the specific preparation [7].

**Fig. 1: -** *Saw palmetto tree and its berries*

SP is a competitive, nonselective inhibitor of each 5α-reductase isoforms, blocking nuclear uptake of dihydrotestosterone (DHT) and lowering DHT binding ability to androgen receptors by almost 50% [8, 9]. SP's fatty acid additives at once inhibit enzyme hobby [10], resource withinside the enzyme's selective hormone transformation processes [11], and have an effect on access to cofactors by affecting the enzyme's conformational state [8]. SP additionally will increase the activity of 3α-hydroxysteroiddehydrogenase, an enzyme changing DHT to its weaker metabolite, androstanediol [7]. However, additionally worth noting are the discordant perspectives concerning SP's real impact on androgen-established parameters [12, 13] and debatable medical efficacy in treating BPH [14, 15]. SP's antiandrogenic properties, minimum side-effect profile [16], and low drug interplay capacity have caused its use as a complementary alopecia remedy [1, 16, 17]. The extract has been evaluated for the remedy of androgenetic alopecia (AGA) [18–21], telogen effluvium (TE) [22–25], seborrheic dermatitis [26, 27], and facial sebum [28], as a monotherapy or in aggregate with different supplements, in oral and topical formulations. In this review, we are able to systematically describe SP extract's efficacy for the remedy of hair loss conditions and related aspect effects. Saw palmetto it is a plant that growns withinside the United States, Central, North and South America and West Indies. In the USA, it is able to be located withinside the marshy regions of Florida, North Carolina, Alabama and Texas. Palm fruit is characterised by purple-black coloring. It grows in clusters, and the fruiting length falls in October - December. Ripe and in part dried culmination are used to put together extracts. In conventional medicine, the interest in noticed palmetto goes lower back to the start of the 19th century. Native Americans consumed this plant to overcome the issues related to prostatic hyperplasia, or testicular swelling and atrophy. In 1926, noticed palmetto was formally brought into the pharmaceutical market, however around 1950 it turned into withdrawn because of the lack of showed medicinal properties. Studies at the plant have been relaunched in the 1980s. [29]

## II. MATERIALS AND METHODS

| *Product* | *Doses* | *Indication* |
|---|---|---|
| *United Kingdom* | | |
| Saw Palmetto capsules | 80, 320, and 450 mg | Symptoms of BPH |
| Multivitamins | Contains: Saw Palmetto (160 mg) | Reproductive health and fertility |
| Protace (WellMan) | | |
| Multivitamins | Contains: Saw Palmetto (160 mg) | Hair loss+nutritional supplement |
| Nanogen (men over 40+) | | |
| Multivitamins | Contains: Saw Palmetto (160 mg) | Hair loss+nutritional supplement |
| Nanogen (men over 20+) | | |
| Multivitamins | Contains: Saw Palmetto extract and Pygeum extract | Symptoms of BPH |
| Formula 600 Plus for men (PSC) | | |
| *Germany* | | |
| Saw Palmetto capsules | 120, 540, 550, 100, and 2500 mg | Symptoms of benign prostate hyperplasia<br>Reproductive health and fertility<br>Hair loss |
| *Pygeum africanum* capsules | 100 mg | Symptoms of BPH |
| Multivitamins | Contains: Pygeum extract | Symptoms of BPH |
| T-Bomb II (MHP) | | |
| Multivitamins | Contains: Pygeum extract | Symptoms of BPH |
| Prostate Health (Biovea) | | |
| Multivitamin | Contains: Saw Palmetto and Pygeum extract | Symptoms of BPH |
| Saw Palmetto Complex (Newton-Everett Biotech) | | |
| *France* | | |
| Saw Palmetto capsules | 160, 295, 300, 320, and 1010 mg | Symptoms of BPH<br>Hair loss |
| Pygeum capsules | 100 and 250 mg | Symptoms of BPH |
| Multivitamin | Contains: Saw Palmetto (60 mg) | Symptoms of BPH |
| Prostata' Home (Dieti Naura Co.) | Contains: Saw Palmetto and Pygeum extract | |
| Sabal/Pygeum (Gph Diffusion) | | |
| *Spain* | | |
| Saw Palmetto capsules | 300 and 550 mg | Symptoms of benign prostate hyperplasia<br>Hirsutism<br>Herbal aphrodisiac |
| Multivitamins | Multiple ingredients including: Saw Palmetto | Hair loss |
| Lambdapil (ISDIN) | | |
| Combination therapy | Multiple ingredients including: Saw Palmetto | Symptoms of BPH |
| Prosor (Soria Natural) | | |
| Combination therapy | Multiple ingredients including: Saw Palmetto (30 mg) | Symptoms of BPH |
| Prosavital (Health Aid) | Pygeum (5 mg) | |
| Combination therapy | Multiple ingredients including: Saw Palmetto (80 mg) | Symptoms of BPH |
| Saw Palmetto (Nature's Bounty) | Pygeum (10 mg) | |
| *Greece* | | |
| Saw Palmetto capsules | 300 and 320 mg | Symptoms of BPH |

**Table 1 –** *Herbal remedies containing α-adrenergic blockers in Europe*

Pygeum africanum, the extract of the African prune tree is used to deal with decrease urinary tract symptoms. It may be used by myself or in aggregate with Saw Palmetto.eleven Pygeum improves the symptoms of BPH via its consequences on bladder contractility, anti inflammatory motion, inhibition of fibroblast production, and endocrine impact, however no impact at the α-adrenergic receptors has been reported.[30] An thrilling and barely unexpected truth of our observe is that the symptoms for the usage of those α1-adverse natural dietary supplements are very variable. This can be because of the usage of a number of those dietary supplements as conventional treatments or the extra 'holistic' remedy notion related to natural treatments. Although Saw Palmetto and different natural treatments had been used for lots of symptoms separately, their aggregate, that is, Saw Palmetto with Pygeum changed into totally used for the remedy of BPH. Plant extracts are extra complicated than artificial compounds and exert their healing motion frequently via multiple pathway and their mode of motion is frequently elusive. Phytotherapy is turning into increasingly famous to deal with an array of medical conditions, and the opportunity of a affected person self-medicating with a substance that may have an effect on iris tone and purpose IFIS is ever growing. IFIS has been related to an extended hazard of intraoperative complications for the duration of intraocular surgical treatment consisting of iris prolapse via surgical wounds, growing pupillary miosis during surgery, iris trauma, and an extended risk of posterior tablet rupture with vitreous loss.[31,32]

Chang et al1 reported an expanded threat of posterior capsular rupture of their IFIS organization patients recording a charge of 12%. Recognition of the threat elements related to IFIS permits the surgeon to put together preoperatively and decrease the threat of surprising intraoperative surprises. Predicting which patients are susceptible to IFIS is important at pre-evaluation and on the preoperative ward round. The affiliation among IFIS and the usage of α-antagonists is established. The consensus is that urologists ought to now no longer extrade their prescribing habits, however ought to consider informing the affected person's ophthalmologist specifically if the affected person has been identified with cataracts or cataract surgical procedure has been planned.[33] Studies analyzing the impact

of natural medication on iris tone are limited, however there was a recommended threat of IFIS via an α-adrenergic pathway, similar to that of Tamsulosin.[34,35,36] To our knowledge, no examine has tested the impact of natural medicines cessation to iris tone, however one might anticipate that impact to be just like that of Tamsulosin cessation.[37]

Adopting an awareness policy just like that for pharmaceutical medicine should suffice. A factor to stress is that our examine highlights a broad use of α-adrenergic antagonistic natural supplements from BPH to hair and used as a herbal aphrodisiac. With the ever developing population's life expectancy, the want for efficient and complication-unfastened cataract surgery will hold to grow. The anticipation and prediction of IFIS threat can assist the operating surgeon minimise the intraoperative complications and result in more secure surgical procedure with increasingly a success outcomes. Patients frequently do not consider natural treatments and nutrients to be medication, and consequently fail to say them except at once precipitated to do so. Our recommendation is that sufferers should be at once requested approximately the usage of opportunity therapies for activity or medicinal purposes, and for the clinician or pre-assessment nurse to be aware of particular formulations which might be or should potentially be related to expanded surgical risk and possibly a compromised surgical outcome.

## III. NYG Suppressed Xenograft Growth of Hepatocellular Carcinoma (HCC) in Vivo

The lipidosterolic fraction of Saw Palmetto is regularly studied and actively used as fitness complement for prevention of BPH and hair loss. Its aqueous fraction is not regularly investigated, however, a previous look at showed that the acidic water extract of Saw Palmetto exhibited anti-oxidant and COX-2 inhibitory effect [38]. This statement additionally similarly supported a few different study at the inhibitory activity of Saw Palmetto berry extract on COX-2, this is associated with its prostate maximum cancers cell growth suppression [39]. In accordance with the preceding look at, we hypothesized that the aqueous fraction of Saw Palmetto may also exhibit tumor inhibitory effect. The water-soluble fraction, specially NYG, became prepared following stringent manufacturing exercise by Heimat Co., Ltd. (Tokyo, Japan). Our initial compound characterization the use of thin layer chromatography has advocated that the containing compounds of NYG are in particular composed of proanthocyanidins and oil elements Further look at in compound characterization the use of various technique is essentially had to confirm the factors contained and characteristic best manipulate of NYG. As NYG is a novel fraction remoted from Saw Palmetto, we first examined its toxicity via way of means of dose escalation technique. Mice have been dealt with NYG at doses of 0.1, 1, 10 and 100 mg/kg via intraperitoneal injection on five consecutive days. One day after injection, four out of five mice at treatment organization of 100 mg/kg died, at the same time as mice withinside the one-of-a-kind groups exhibited everyday behavior. After four-days of intervention, the mice in 100 mg/kg NYG treatment organization died. The LD50 of unmarried remedy became calculated as approximately 66.3 mg/kg. NYG control below LD50 is considered safe. Int. J. Mol. Sci. 2016, 17, 1277 3 of 13 Saw Palmetto, we first examined its toxicity via way of means of dose escalation technique. Mice have been dealt with NYG at doses of 0.1, 1, 10 and 100 mg/kg via intraperitoneal injection on five consecutive days. One day after injection, four out of five mice at remedy organization of 100 mg/kg died, even as mice withinside the opposite groups exhibited ordinary behavior. After four-days of intervention, the mice in 100 mg/kg NYG remedy organization died. The LD50 of single treatment became calculated as approximately 66.3 mg/kg. NYG administration beneath LD50 is considerd safe.

Next, we examined the in vivo anti-tumor effect of NYG on xenograft boom of MHCC97L cell in nude mice. NYG remedy (5 mg/kg and 10 mg/kg every days) come to be administrated intraperitoneally after one week of tumor inoculation. PBS and beta-cyclodextrin (B-CD) come to be given to bad manipulate agencies of mice on the equal time as mice receiving doxorubicin (25mg/kg) served as excellent manipulate. We positioned that treatment of NYG exhibited least toxicity to the mice, as evidenced via way of means of protection of frame weight throughout the complete treatment. As postulated, the mice group intervened with NYG (10 mg/kg) exhibited slower boom price of HCC cells in contrast to automobile receiving group. Both doses of NYG control reduced tumor period via way of means of the give up of four-week treatment; on the equal time as NYG in 10 mg/kg tested a good deal powerful tumor inhibitory effect recommended the dose-dependent efficacy of NYG. Treatment of B-CD, the pharmaceutical excipient of NYG showed minimal effect on tumor boom and frame weight of mice, which reflected that the anti-tumor interest on human HCC is simplest contributed via way of means of NYG itself. Immunostaining of CD31 on xenograft HCC tumor showed big decreased micro-vessel formation after NYG intervention. Overall, the ones outcomes postulate that NYG inhibited HCC xenograft boom and the effect is in particular contributed by reduced angiogenesis in tumor environment.

## IV. NYG Inhibited Orthotopic Implanted HCC Growth in Vivo

Xenograft version is frequently used because the first line version for investigating the anti-most cancers efficacy of latest healing agents, however, this preclinical version has its quandary in reflecting the liver tumor microenvironment and renders terrible prognostic final results of drug efficacy [40]. Therefore, we established the orthotopic HCC implantation version wherein the MHCC97L cells tagged with luciferase are implanted onto the proper lobe of mice liver. The orthotopic HCC tumor growth might be monitored through live-animal imaging at some point of the intervention period. After one-week of version establishment, the mice with observable luciferase depth might be selected and similarly randomized into groups: Negative manipulate organization receiving PBS, and NYG (10 mg/kg) intervention organization. As found from the luciferase sign depth plot, the orthotopic HCC tumor boom rate become decelerated in NYG intervened mice organization after Week 2 of treatment, whilst the tumor growth of vehicle-receiving mice organization improved exponentially inside 5 weeks. By the give up of experiment, we found vast discount in liver tumor length of NYG-intervened organization, which accounted for about 60% suppression of HCC tumor growth in NYG-dealt with mice compared to govern mice. Similar to subcutaneously grown tumor, NYG intervention additionally considerably decreased CD31-advantageous cell populations in orthotopically-grown liver tumor, counseled the tumor inhibitory impact of NYG on orthotopic implanted HCC growth can be in part contributed through decreased neovascularization through NYG.

## V. NYG Exerted Minimal Effect on in Vitro Cultured HCC Cells

To elucidate the impact of NYG, we in addition investigated whether or not the fraction suppresses HCC cell proliferation. The MTT assay become performed to examine the cytotoxic doses of NYG on individual HCC cells. Surprisingly, NYG as much as 500 μg/mL exhibited no powerful cytotoxicity to HepG2 and MHCC97L, the 2 human hepatocellular carcinoma mobileular lines, even though the incubation time is prolonged to seventy two hours. As predicted from the minimum toxicity incurred by NYG on HCC cells, NYG additionally exerted no cytotoxicity on regular hepatic cell line L-02, as much as concentration of 500 μg/mL. Prompted with the aid of using the remark of decreased CD31-stained in vivo vascular mobileular density, we in addition tested the expression of VEGF, the

angiogenic-favoring factor in NYG-dealt with HCC cells. The MHCC97L cells have been supplemented with 250 and 500 µg/mL of NYG; the cells and culture supernatant have been harvested after 48 h of incubation. The quantitative PCR evaluation confirmed that NYG intervention has least impact on mRNA expression of VEGF, in each normoxia and hypoxic condition. To validate, the secretion of VEGF protein by MHCC97L cells become decided with the aid of using ELISA assay, and we did now no longer located any inhibition on VEGF secretion by NYG (Figure 3E). These outcomes imply that the tumor inhibitory impact of NYG become independent to its action on HCC.

## VI. Discussion

Hair loss is related to large results affecting body image, self-esteem, emotional well-being, and QOL [41], probably even main to psychiatric morbidity consisting of anxiety and depression [42, 43]. While minoxidil and finasteride stay the simplest United States Food and Drug Administration (FDA)-approved and maximum broadly used treatments for sample hair loss [44], un- Saw Palmetto, a Systematic Review in Alopecia Skin Appendage Disord 7 DOI: 10.1159/000509905 preferred aspect outcomes have caused the look for opportunity treatments [45]. SP is a key factor in lots of overthe-counter dietary supplements advertised for hair regrowth; however, constrained records exist to help its efficacy in diverse alopecias or to higher delineate its aspect-impact profile. The tremendous majority of records concerning SP's efficacy, antiandrogenic houses in vitro, and aspect-impact profile are derived from research on BPH [8, 9] and remedy of urinary signs and symptoms in vivo [3–5]. However, lots of those findings were referred to as into question, given next trials displaying no outcomes on androgen-based parameters while SP is as compared to standard antiandrogenic dealers consisting of finasteride [12, 13]. Despite severa reviews concerning SP's scientific efficacy, complete meta-analyses have failed to exhibit large development in BPH signs and symptoms or objective ailment parameters, as a consequence casting doubt on SP's formerly attributed antiandrogenic properties [14, 15].

Clinical proof concerning the efficacy of SP-containing products to deal with hair loss is limited. SP has proven promising outcomes in murine models, with hair regrowth mediated via reworking increase component-β and mitochondrial signaling pathways [46]. Additionally, in vitro models have established SP's cappotential to inhibit inflammatory gene expression in human keratinocytes, suggesting a multifaceted mechanism for the remedy of AGA, similarly to its proposed antiandrogenic properties [41]. The mechanism wherein SP instigates hair increase in TE isn't always absolutely clear. A feasible rationalization can be secondary to its anti inflammatory properties, or to β-sitosterol's purported angiogenic effects, stimulating vascular endothelial increase component in vitro and promoting neovascularization in vivo [42].

## VII. Conclusion

The improvement of technology, cosmetology, remedy and client focus forces the producers to look for new energetic materials of each plant and synthetic origin. Although sturdy efficacy records are lacking, SP extract in both topical or oral formulations can also additionally have a function withinside the remedy of hair loss issues which include AGA or TE, demonstrating modest development in hair regrowth. we tested the anti-tumor impact of NYG, the aqueous fraction of Saw Palmetto Extract, on human hepatocellular carcinoma. NYG exhibited powerful inhibitory impact of HCC growth in each xenograft and orthotopic tumor models via suppression of neovascularization in tumor stroma. NYG did now no longer exert toxicity to HCC cells, nor should it reduce VEGF expression in HCC cells. Instead, NYG suppressed the migration and sprout formation of endothelial cells in tumor stroma, which might be the primary contribution to its anti-tumor impact.

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