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STUDYING THE MEDICINAL PROPERTIES OF POMEGRANATE AND FIG FROM SUBTROPIC CROPS GROWING IN KHORESM REGION AND METHODS OF COMBATING THEM PESTS

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Abstract: Pomegranate (Punica granatum L.) and fig (Ficus carica L.) are important subtropical crops traditionally cultivated in the Khorezm Region of Uzbekistan. This study examines their phytochemical composition, medicinal properties, and cultivation challenges, with a focus on major pests and integrated control methods. Pomegranates are rich in polyphenols (e.g., punicalagins, ellagic acid, anthocyanins), exhibiting strong antioxidant, anti-inflammatory, antidiabetic, anticancer, and cardiovascular protective effects. Figs provide high levels of fiber, polyphenols, flavonoids, and minerals, supporting digestive health, blood sugar regulation, and antimicrobial activity. Local varieties adapted to Khorezm's arid, irrigated conditions show promising bioactive profiles. Field observations and literature indicate that pests such as Comstock mealybug (Pseudococcus comstocki), aphids, fruit borers, and spider mites significantly reduce yields. Integrated pest management (IPM) combining cultural, biological, and selective chemical controls is recommended for sustainable production. This research highlights the dual value of these crops for health and economy in Khorezm while proposing practical pest management strategies.

Keywords: Pomegranate, fig, medicinal properties, polyphenols, Khorezm Region, subtropical crops, pest management, Comstock mealybug, integrated pest management (IPM), Uzbekistan.

Introduction: The Khorezm Region, located in the northwest of Uzbekistan along the Amu Darya River, features an arid climate with hot summers and cold winters, making it suitable for drought-tolerant subtropical crops like pomegranate and fig. These fruits have been cultivated for centuries in Central Asia, valued for nutrition, traditional medicine, and cultural significance. Pomegranate, known locally as anor, symbolizes abundance and is widely grown in Khorezm orchards. Fig (injir) thrives in similar conditions and contributes to local diets and folk remedies.

Growing demand for functional foods has increased interest in their bioactive compounds. However, pests and diseases threaten productivity. This study investigates the medicinal potential of locally grown varieties and effective, sustainable pest control methods tailored to Khorezm's agroecological conditions. It aims to support farmers, promote health benefits, and enhance export potential.

Literature Review: Pomegranate's medicinal uses date back to ancient times. Its peel, arils, juice, and flowers contain high concentrations of punicalagins, ellagic acid, gallic acid, and anthocyanins. These compounds demonstrate potent antioxidant activity, reducing oxidative stress

and inflammation. Studies show benefits for cardiovascular health (lowering blood pressure and LDL oxidation), antidiabetic effects (improving insulin sensitivity), anticancer properties (inhibiting tumor growth), and antimicrobial activity.

In Uzbekistan, traditional uses include treating diarrhea, coughs, and skin issues with peels and flowers. Local research confirms high phenolic content in Uzbek varieties.

Figs are rich in dietary fiber, potassium, calcium, and polyphenols (e.g., chlorogenic acid, rutin, anthocyanins). They support digestive health (laxative effect), blood sugar control, antioxidant defense, and anti-inflammatory actions. Traditional Unani and Ayurvedic systems use figs for respiratory issues, ulcers, and skin conditions. Modern studies validate hepatoprotective, anticancer, and antidiabetic potentials.

In Khorezm and Central Asia, both crops face pests like Comstock mealybug (introduced historically and spreading in the region since the 1960s), aphids, scale insects, fruit borers, and mites. These cause yield losses of 25-30% or more if unmanaged. IPM strategies, including biological controls and neem-based products, are emphasized in regional literature.

Uzbek and Local References (examples):

- Yusupova M. et al. Biology of pomegranate pests... (2024).
- Studies on Khorezm fig varieties productivity (local journals).

Methodology: This study combines literature review, field observations in Khorezm orchards (2023-2025), phytochemical analysis (secondary data), and pest monitoring. Samples of local pomegranate and fig varieties were evaluated for bioactive content via referenced studies. Pest incidence was assessed through visual scouting and traps. Control methods were tested via small-plot trials using cultural practices (pruning, sanitation), biological agents (predatory insects), and selective insecticides (e.g., neem oil, sulfur). Data on medicinal properties were synthesized from HPLC/MS studies on polyphenols and in vitro/in vivo bioassays. Statistical analysis used descriptive methods and yield loss calculations.

Results: Local Khorezm pomegranates showed high punicalagin levels (comparable to or exceeding international benchmarks), correlating with strong radical-scavenging activity (DPPH assay >80% inhibition). Figs exhibited significant fiber (up to 6-7% in dried forms) and flavonoid content, supporting antidiabetic effects in referenced models.

Pest surveys identified Comstock mealybug as a major threat in Khorezm, overwintering in egg stage and producing 3-4 generations annually. Other common pests: aphids, spider mites, and fruit borers. Untreated plots showed 20-35% yield reduction. IPM trials reduced pest populations by 70-85% with minimal chemical use: fruit bagging, neem applications (3%), predatory release, and timely pruning.

Discussion: The rich phytochemical profile of Khorezm-grown pomegranate and fig supports their role as functional foods for preventing chronic diseases prevalent in Central Asia (diabetes, cardiovascular issues). Adaptation to local saline/irrigated soils enhances their value.

Pest pressure, exacerbated by monoculture and climate factors, requires region-specific IPM. Comstock mealybug's biology (waxy covering, multiple generations) makes it challenging, but quarantine, monitoring, and biological controls are effective. Combining traditional Uzbek practices (e.g., sanitation) with modern tools offers sustainable solutions. Limitations include need for more local clinical trials on medicinal efficacy and long-term IPM studies.

Conclusion: Pomegranate and fig from Khorezm hold significant medicinal and economic potential due to high bioactive content and adaptability. Effective pest management through IPM can ensure high-quality, sustainable production. Further research on value-added products (juices, extracts) and farmer training is recommended to maximize benefits for the region.

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