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COMPREHENSIVE PHARMACOGNOSTICAL INVESTIGATIONS OF *Chenopodium* OF THE FLORA OF KINGDOM OF MOROCCO

Fakkari Marwa 3th year student of Pharmacy speciality, Fatima K. Serebryanaya, PhD, associate professor, Similla L. Adjiahmedova, PhD, associate professor

Fakkari Marwa

Pyatigorsk medical and pharmaceutical institute, Pyatigorsk, Russia

This study characterized the chemical composition of essential oils from *Chenopodium ambrosioides* L., a plant used in traditional Moroccan medicine, collected from four distinct regions: Salé, Agadir, Meknes, and Mrirt. Analysis via GC-MS and Principal Component Analysis (PCA) revealed significant regional variations in the percentages of key compounds such as Terpinolene, p-Cymene, and p-Cymen-7-ol. A notable finding was that the compound p-1,3,8-Menthatriene was exclusive to the essential oil from the Mrirt region. The PCA further confirmed these differences by clearly separating the oils into three distinct groups. The study concludes that this chemical variability is likely influenced by abiotic factors specific to each region, including climate, altitude, and soil composition.

PURPOSE

This research aims to provide a comprehensive pharmacognostic evaluation of *Chenopodium album* L. from the Moroccan flora to scientifically validate its traditional uses and determine its potential as a source for new phytopharmaceuticals. The multi-faceted approach will include detailed morphological and anatomical studies of the plant's roots, shoots, and leaves, alongside a phytochemical analysis to identify its key bioactive compounds. Furthermore, the study will assess the in vitro antioxidant activity of hydro-alcoholic extracts to quantify a fundamental pharmacological property. By integrating this botanical, phytochemical, and biological data, the work seeks to establish a scientific basis for the plant's traditional applications and explore its potential for future cultivation and drug development.

Materials and methods. The study focused on the aboveground and underground organs of *Chenopodium album*, collected by the author in various regions of Morocco, as well as specimens grown in the Botanical Garden of the St. Petersburg Polytechnic Institute.

potent antioxidant

inflammatory effects

PHARMACOLOGICAL PROPERTIES OF *Chenopodium* .

Promising cytotoxic activity

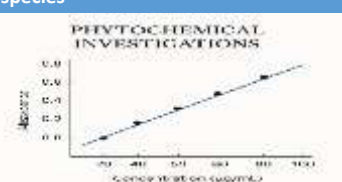
hypolipidemic activity

BIOCLIMATE:

Chenopodium album exhibits high adaptability to various bioclimatic conditions. It thrives in semi-arid to sub-humid Mediterranean climates, tolerating both temperature extremes and moderate drought. The species shows optimal growth in regions with mean annual temperatures between 8-25°C and annual precipitation ranging from 400-800 mm. Its weedy nature allows it to exploit disturbed habitats across different elevational gradients, from coastal areas to mid-mountain regions, demonstrating remarkable ecological plasticity in both natural and anthropogenic environments

PHYTOCHEMICAL INVESTIGATIONS

Phytochemical analysis reveals *Chenopodium album* is rich in flavonoids, phenolic acids, and saponins, with additional presence of alkaloids, tannins, and terpenoids. These compounds contribute to its significant antioxidant, anti-inflammatory, and antimicrobial properties. The plant also contains valuable nutrients including proteins, vitamins (A and C), and minerals, supporting its dual role as both a medicinal and nutritional species



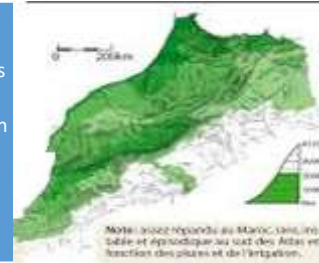
TRADITIONAL USE: Used as a cooked leafy green vegetable similar to spinach

Prepared as herbal teas and decoctions to treat digestive issues

Applied topically in poultices for skin inflammations and wounds

DISTRIBUTION:

Chenopodium album L. is a cosmopolitan weed with a global distribution, found across temperate to tropical regions worldwide. It commonly grows in disturbed, nitrogen-rich habitats such as agricultural fields, gardens, and roadsides. In Morocco, it is widely distributed as a native annual plant across various regions.



MICROMORPHOLOGICAL INVESTIGATIONS:

Reveals distinctive anatomical features. The leaf epidermis exhibits polygonal cells with irregular walls and characteristic farinose epicuticular wax deposits, giving the surface a mealy appearance. Diagnostic balloon-shaped trichomes and glandular structures are densely distributed across aerial parts. Cross-sections of the stem show prominent collenchyma tissue and bicollateral vascular bundles. The root anatomy displays a well-developed periderm and secondary vascular arrangement. Numerous druses of calcium oxalate are observed in parenchymatous tissues of all organs, a key identifying feature. These microscopic characteristics provide crucial taxonomic markers and quality control parameters for the plant's identification.

MORPHOLOGICAL INVESTIGATIONS

The morphological investigation of *Chenopodium album* L. reveals an annual herb with a bushy habit, characterized by a fibrous taproot and angular, often reddish-streaked stems. A definitive morphological feature is the pervasive mealy or farinose coating of white, powdery particles on the stems and young parts. The leaves are simple, highly variable, but typically rhombic-ovate to lanceolate with irregularly dentate margins. The inflorescence is a dense, granular-feeling panicle composed of numerous small, greenish flowers, each with five sepals and no petals, culminating in a single utricle fruit.



INTRODUCTION OF *Chenopodium album* L. in the Botanical garden of Pyatigorsk medical and pharmaceutical institute, Pyatigorsk, Russia

Comparative morphometric analysis of chenopodium from Morocco and Botanical Garden of Pyatigorsk

