

Ministry of Higher Education
Salahaddin University-Erbil
Field Crops and Medicinal Plants Department



INTRODUCTION TO NATURAL PRODUCTS

Third Grade

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Lecture 1



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What is
natural product?

- The broadest definition of a natural product is anything that is produced by life, and includes biotic materials (e.g. wood, silk), bio-based materials (e.g. bioplastics, cornstarch), bodily fluids (e.g. milk, plant exudates), and other natural materials that were once found in living organisms (e.g. soil, coal).
- A natural product is a chemical compound or substance produced by a living organism.

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What is natural product?

- They may be extracted from tissues of plants, marine organism or micro - organism fermentation or any biological molecule is a natural product.
- These compounds are not typically created through human intervention or chemical synthesis in a laboratory. Instead, they are synthesized by the organism as part of its natural metabolic processes and often serve specific biological functions within that organism.

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History of plant natural products

- The history of the extraction of natural products dates back to Mesopotamian and Egyptian times, where production of perfumes or pharmaceutically - active oils and waxes was a major business.
- Discovery of Medicinal Plants in Ancient Greece and Rome
(Around 500 BCE - 500 CE): The ancient Greeks and Romans made significant contributions to the understanding of natural products.

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History of plant natural products

- In archaeological excavations 250 km south of Baghdad extraction pots from about 3500 BC were found, made from a hard, sandy material presumably air - dried brick earth.
- Several Sumerian texts also confirm that a sophisticated pharmaceutical and chemical technology existed



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History of plant natural products



- Natural extracts were subjected to separation into component compounds, which were then purified and analysed.
- In the late 1800's, synthetic methods were being developed for some of these natural compounds.
- It was discovered that natural extracts had more complex compositions and properties than salts and minerals.



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History of plant natural products

Discovery of Vitamins and Phytochemicals (20th Century):

- The 20th century witnessed groundbreaking discoveries related to plant natural products.
- The identification of essential vitamins, such as vitamin C from citrus fruits, and phytochemicals like resveratrol, highlighted their importance in nutrition and health.

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History of plant natural products

Modern Pharmacognosy and Ethnobotany (20th Century - Present):

Scientific disciplines like pharmacognosy and ethnobotany emerged to study the medicinal and cultural significance of plant natural products.

- Researchers started documenting traditional knowledge about plant remedies from indigenous communities.



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Importance of natural products in Modern Medicine and Industry

- Natural products, including those derived from plants, play a vital role in modern medicine and various industries. Their importance is driven by their diverse chemical structures and biological activities.

Here are some key reasons why natural products are crucial in modern medicine and industry:

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Importance of natural products in Modern Medicine and Industry

1. Source of Pharmaceuticals

- Many important drugs and therapeutic agents have their origins in natural products. These compounds serve as inspiration and starting points for drug discovery and development.
- Examples include penicillin (derived from the fungus *Penicillium*), morphine (from the opium poppy), and aspirin (originating from willow bark).



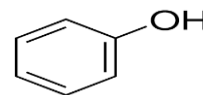
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Importance of natural products in Modern Medicine and Industry

• 2. Drug Discovery and Development:

- Natural products continue to be a valuable source of new drug leads and potential pharmaceuticals. Researchers explore natural compounds for their potential to treat a wide range of diseases, including cancer, infectious diseases, and neurological disorders.
- The structural diversity of natural products provides a vast pool of compounds to investigate for therapeutic effects.



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Importance of natural products in Modern Medicine and Industry

• 3. Novel Pharmacological Properties:

- Natural products often exhibit unique and diverse pharmacological properties, making them attractive candidates for drug development.
- Compounds like taxol (from yew trees) and artemisinin (from sweet wormwood) have had a significant impact on cancer and malaria treatment, respectively.

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Importance of natural products in Modern Medicine and Industry

• 4. Sustainable Agriculture:

- Plant natural products are used in agriculture as biopesticides, plant growth regulators, and natural herbicides. They offer sustainable alternatives to synthetic chemicals and promote environmentally friendly farming practices.
- Examples include neem-based pesticides and plant-derived essential oils for pest control.



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Neem



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Importance of natural products in Modern Medicine and Industry



5. Cosmetics and Personal Care:

- Natural products are commonly used in cosmetics and personal care products due to their perceived safety and natural origins.
- Ingredients like aloe vera, chamomile are used in skincare and haircare formulations.



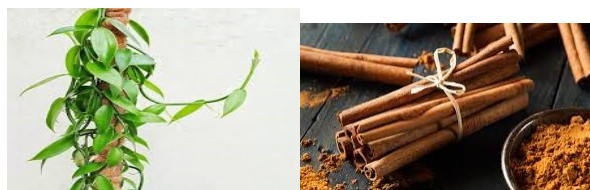
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Importance of natural products in Modern Medicine and Industry

6. Food and Beverages:

- Natural products, such as spices, herbs, and flavor compounds derived from plants, enhance the taste and nutritional value of food and beverages.
- Examples include vanilla (from vanilla orchids), cinnamon, and essential oils used in food flavorings.



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Importance of natural products in Modern Medicine and Industry

7. Sustainable Materials and Chemicals:

- Plant-based natural products are used to produce sustainable materials, including biodegradable plastics and biofuels.
- For example, bioethanol is produced from plant-derived sugars and starches.



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Importance of natural products in Modern Medicine and Industry



8. Biotechnology and Enzymes:

- Natural products play a role in biotechnology through the production of enzymes and used in various industrial processes.
- Enzymes derived from microorganisms have applications in food processing, biofuel production, and more.



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Importance of natural products in Modern Medicine and Industry



9. Traditional Medicine and Cultural Heritage:

- Indigenous and traditional knowledge of plant-based remedies is an important part of cultural heritage and healthcare in many societies.
- Some traditional remedies have led to the discovery of new pharmaceutical compounds.



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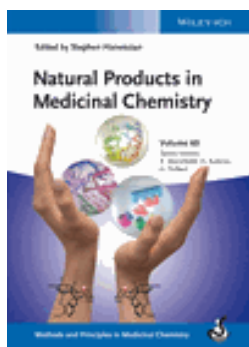
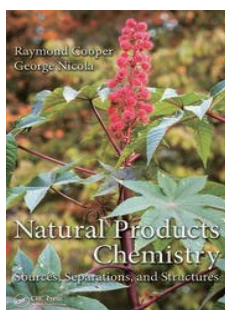
Importance of natural products in Modern Medicine and Industry

10. Biodiversity Conservation:



- The sustainable harvesting and protection of plants used for natural products can promote biodiversity conservation and support the livelihoods of local communities.
- In summary, natural products from plants and other sources continue to be a valuable resource for modern medicine and a wide range of industries.

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References

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