* **Phytoestrogens**

 **lect 7**

**compound of secondary metabolites Plants synthesize their name comes from the** [**Greek**](https://en.wikipedia.org/wiki/Greek_language) ***phyto* ("plant") and *estrogen*, the hormone which gives fertility to** [**female mammals**](https://en.wikipedia.org/wiki/Female_mammals)**.**  **the word "**[**estrus**](https://en.wikipedia.org/wiki/Estrus)**" - Greek οίστρος - means "**[**sexual desire**](https://en.wikipedia.org/wiki/Sexual_desire)**", and "gene" - Greek γόνο - is "to generate".**

**Phytoestrogens are chemicals which act like the hormone estrogen.** [**Estrogen**](https://en.wikipedia.org/wiki/Estrogen) **is important for women's bone and heart health, but high amounts of it has been linked to breast cancer. In the plant, the phytoestrogens are involved in the defense system against fungi.**

 **are widespread in food, including herbs and seasonings (garlic, parsley), grains (soybeans, wheat, rice), vegetables (beans, carrots, potatoes), fruits (date, pomegranates, cherries, apples), and drinks (coffee ,tea).**

* **Classification Phytoestrogens.**

**There are three main classes of phytoestrogens:**

1. **Isoflavones.**

**Isoflavones, specifically genistein and daidzein, have the highest estrogen properties and are found in legumesبقوليات such as soy, chickpeasحمص , cloveقرنفل , lentilsعدس and beansفاصوليا**

1. **Coumestans.**

**Coumestans are found in sprouting plants.**

1. **Lignans.**

**Lignans are found in flaxseedsبذور الكتان , lentilsعدس , whole grainsحبوب كاملة , beans, berriesتوت , fruits and vegetables.**

**4-** [**Mycoestrogens**](https://en.wikipedia.org/wiki/Mycoestrogens) **have similar structures and effects, but are not components of plants; these are mold metabolites of** [***Fusarium***](https://en.wikipedia.org/wiki/Fusarium)**.**

* **Mechanism of action**

**Phytoestrogens exert their effects primarily through binding to** [**estrogen receptors**](https://en.wikipedia.org/wiki/Estrogen_receptor) **(ERs) Estrogen receptors (ERs) are a group of** [**proteins**](https://en.wikipedia.org/wiki/Proteins) **found inside** [**cells**](https://en.wikipedia.org/wiki/Cell_%28biology%29)**. They are** [**receptors**](https://en.wikipedia.org/wiki/Receptor_%28biochemistry%29) **that are activated by the** [**hormone**](https://en.wikipedia.org/wiki/Hormone)[**estrogen**](https://en.wikipedia.org/wiki/Estrogen) **(**[**17β-estradiol**](https://en.wikipedia.org/wiki/17%CE%B2-estradiol)**).**[**[1]**](https://en.wikipedia.org/wiki/Estrogen_receptor#cite_note-pmid17132854-1) **Two classes of ER exist: nuclear estrogen receptors (**[**ERα**](https://en.wikipedia.org/wiki/ER%CE%B1) **and** [**ERβ**](https://en.wikipedia.org/wiki/ER%CE%B2)**), which are members of the** [**nuclear receptor**](https://en.wikipedia.org/wiki/Nuclear_receptor) **family of** [**intracellular**](https://en.wikipedia.org/wiki/Intracellular) **receptors, and** [**membrane estrogen receptors**](https://en.wikipedia.org/wiki/Membrane_estrogen_receptor) **(mERs) .**

**and many phytoestrogens display somewhat higher** [**affinity**](https://en.wikipedia.org/wiki/Ligand_%28biochemistry%29#Receptor.2Fligand_binding_affinity) **for ER-β compared to ER-α.**

**The key structural elements that enable phytoestrogens to bind with high affinity to estrogen receptors and display estradiol-like effects are:**

* **The phenolic ring that is indispensable for binding to estrogen receptor.**
* **The ring of isoflavones mimicking a ring of estrogens at the receptors binding site.**
* **Low molecular weight similar to estrogens (MW=272).**
* **Distance between two hydroxyl groups at the isoflavones nucleus similar to that occurring in estradiol.**
* **Optimal hydroxylation pattern.**
* Physiological role

**These compounds in plants are an important part of their defense system, mainly against fungi. Phytoestrogens are ancient naturally occurring substances, and as dietary phytochemicals they are considered as co-evaluativeمتعاونة with mammals. In the human diet, phytoestrogens are not the only source of exogenous estrogens.** [**Xenoestrogens**](https://en.wikipedia.org/wiki/Xenoestrogens)**(are a type of** [**xenohormone**](https://en.wikipedia.org/wiki/Xenohormone) **that imitates يقلد** [**estrogen**](https://en.wikipedia.org/wiki/Estrogen)**. They can be either synthetic or natural** [**chemical compounds**](https://en.wikipedia.org/wiki/Chemical_compound)**. Synthetic xenoestrogens are widely used industrial compounds), which have estrogenic effects on a living organism even though they differ chemically from the estrogenic substances produced internally by the** [**endocrine system**](https://en.wikipedia.org/wiki/Endocrine_system) **of any organism.**

**Natural xenoestrogens include** [**phytoestrogens**](https://en.wikipedia.org/wiki/Phytoestrogen) **which are plant-derived xenoestrogens. Because the primary route of exposure to these compounds is by consumption of phytoestrogenic plants, they are sometimes called "dietary estrogens".**

**xenoestrogens** **are found as** [**food additives**](https://en.wikipedia.org/wiki/Food_additive)**, and also in cosmetics, plastics, and insecticides. Environmentally, they have similar effects as phytoestrogens.**

## Ethnopharmacology([traditional medicine](https://en.wikipedia.org/wiki/Traditional_medicine%22%20%5Co%20%22Traditional%20medicine))

**In some countries, phytoestrogenic plants have been used for centuries in the treatment of menstrual انقطاع الطمث and menopausal problems مشاكل الطمث, as well as for fertility problems.**[**]**](https://en.wikipedia.org/wiki/Phytoestrogens#cite_note-53) **Plants used that have been shown to contain phytoestrogens include** [***Pueraria***](https://en.wikipedia.org/wiki/Pueraria) ***mirifica*, and its close relative,** [**kudzu**](https://en.wikipedia.org/wiki/Kudzu)**,[**[**Angelica**](https://en.wikipedia.org/wiki/Angelica)**,** [**fennel**](https://en.wikipedia.org/wiki/Fennel) **and** [**anise**](https://en.wikipedia.org/wiki/Anise)**.In a rigorous study, the use of one such source of phytoestrogen,** [**red clover**](https://en.wikipedia.org/wiki/Trifolium_pratense)**, has been shown to be safe, but ineffective in relieving menopausal symptoms (**[**black cohosh**](https://en.wikipedia.org/wiki/Actaea_racemosa) **is also used for menopausal symptoms, but does not contain phytoestrogens.) Panax** [**Ginseng**](https://en.wikipedia.org/wiki/Ginseng) **contains phytoestrogens and has been used for menopausal symptoms .**