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Review Article

A REVIEW ON PHYTO-ESTROGENS

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Abstract:

Phytoestrogens are trace biochemical produced by plants that act like estrogens in animal cells and bodies. A number of in-vivo studies have reported a connection between high dietary intake of phytoestrogens and lower rates of certain cancers, cardiovascular problems and menopauseal symptoms.

Keywords: Phytoestrogens, Estrogen, Estrogen receptors, Sex hormone binding globulin, trans-active Peroxisome proliferator activated receptors, Flavones, Isoflavonoids, Lignans.

Introduction

Definition: The phytoestrogens are naturally occurring chemicals of plant origin that have the ability to cause estrogenic and/or anti-estrogenic effects due to their structural similarities to the human hormone estradiol (17beta estradiol). 1

Mechanism of Action

Phytoestrogens exert their effects primarily by binding to estrogen receptors (ER). There are two variants of the estrogen receptor, ER-Alpha and ER- beta. Many phytoestrogens display higher affinity for ER-Beta compared to ER-Alpha. 2

Phytoestrogens may also modulate the concentration of endogenous estrogens by binding or inactivating enzymes and may affect the bioavailability of sex hormones by binding or stimulating the synthesis of sex hormone binding globulin (SHBG). 2

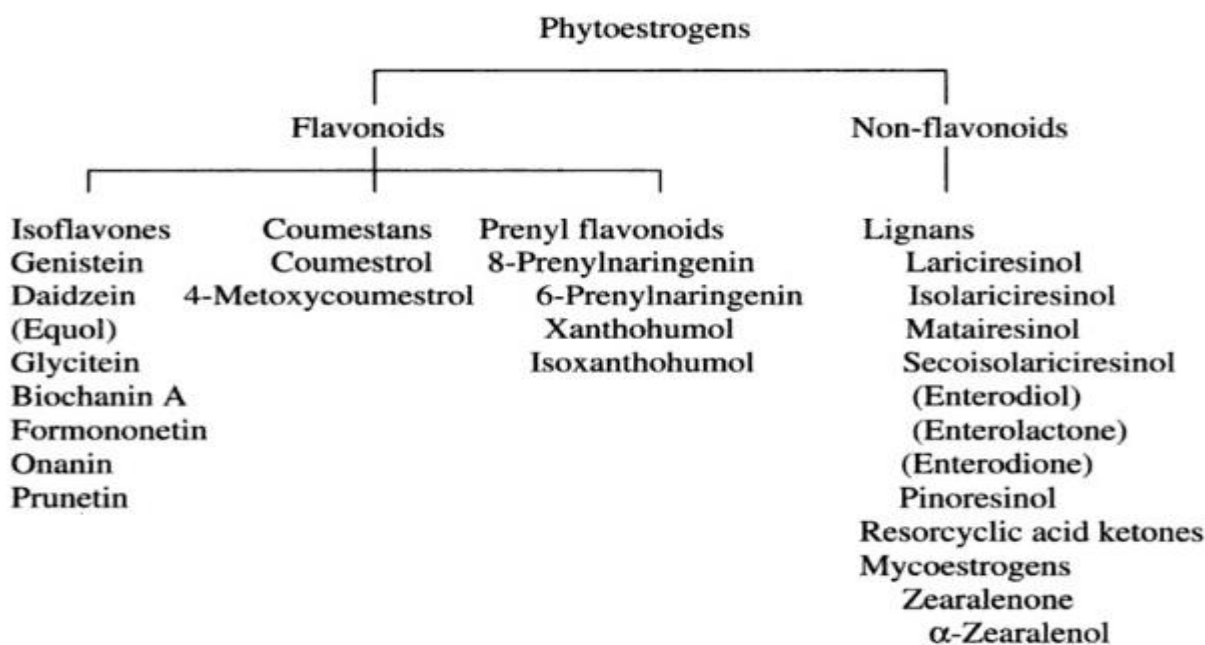
Some phytoestrogens bind to an Trans-activate peroxisome proliferator-activated receptors (PPARs) -thus produce a balance pleiotropic actions. 2

History

In the 1940’s, it was first realized that some plant derived compounds could cause estrogenic effects in animals. Sheep grazing on pastures containing red clover had multiple fertility problems. The red clover in these pastures had high amounts of isoflavones formonetin and biochanin A. The phytoestrogens diadzein and Genistein were responsible for the infertility of some captive cheetahs fed a soya bean –enriched diet subsequently found to contain high quantities of these compounds. 3

Evidence is beginning to accrue that phytoestrogens may begin to offer protection against a wide range of human conditions, including breast, Bowel, Prostate, and other cancers, cardiovascular diseases, brain function, alcohol abuse, and menopausal symptoms. The basis for these effects has not been established, but weak estrogenic activity of Iso-flavones may be the factor in conferring these properties. Soy, which has been known to be the richest source of isoflavones, has attracted much attention as a potentialchemoprotective factor. [3]

Classification: 4



S.no	Phytoestro gen	Plant	Family	Biological activity	Animal model	Dose	Standar d dose	P-value	Reference
1	Genistein	Soy	Legumino sae/ Fabacae	Breast cancer/ Perinatal mammary	Sprague dawley - CD rats	0, 25, 250m g/kg	250 mg/kg	<0.001	Itz. W A, Coward L, Wang J , Lamartiniere CA , Carcinogenesis vol.19

				cancer prevention					Issue No.12 , 1998 Pp -2151-2158. 5
				Acute and chronic anti depressant effect, Amitryptiline .	Adult male albino-mice (BALB/c strain)	5, 10mg /kg	10 mg/kg	<0.001 <0.1	Steru L, Chermat.R, Thierry.B, simon.P, "the tail suspension test : a new method for screening anti- depressants in mice" , Psychopharmacology, vol.85, issue.3, 1985 , Pp-367-370.6
				Ischemic post conditing / cardioprotective estrogen	Rabbits	100-1000 Micr og /kg	100 microg /kg	<0.05	Tissier R. Waintraub.X , Coureur.N . Journal of molecular and Cellular Cardiology, Volume 42, issue 1, jan 2007, page 79-87. 7.
				Anti-osteoporosis	Female SD rats	4.5-9 mg/k g	4.5 mg/kg	<0.01	Bitto A, Burnett.BP, Polito.F, Levy RM, Marini.H, British journal of Pharmacology, volume 156, issue 8, Pp 7135-7165. 8.
				Inhibiton of intestinal perstalisis	Guinea pig	10-300m icro mol/I	10,300 micro mol/I	<0.1	Gharzouli.K, holzer.P , Pharmacology 2004, 70:5-14. 9.
2	Biochainin A	Peanut	Legumino sae	Inhibition of FAAH	Male wistar /	10-30	10 micro	<0.001	Thors.L, Burston.JJ, Alter.BJ, mckinney. MK,

			, Fabaceae		SD-rats	micr o g/kg	g/kg		Cravatt. BF, Fowler.CJ, British journal of pharmacology 2010 , vol 160, issue 3, 549-560. 10.
				Anti inflammato ry	SD rats	10, 20, 40 micr o g/kg	20micro g/kg	<0.05	Song jin lee, ho jin baek, Chang hee le, hyun pyo kim, archive of Pharmacal reaserch, feb.1994, vol.17, issue.1, pp-31-35. 11
				Anti hyper glycemic, anti lipemic	Adult male albino rats of wistar strain	10mg /kg- 15mg .kg	10mg/k g	<0.05	Ranganathan harini, ezumalai muthukrishnan, viswanathan pugalendi, European journal of Pharmacology 676 (1-3): 89-94. dec.2011.12.
				Alzeimers disease treatment	Adult male albino rats of wistar strain	10- 40mg /kg	10mg/k g	<0.05	Biradar SM , Joshi H, chheda TK, Human and experimental toxicology - 33[4] , 2014, PP: 369- 382. 13.
				Neuropathi c pain reliever	Male albino wistar rats	0.1,1, 5mg/ kg	0.1,1,5m g/kg	<0.05 <0.01 <0.001	Venkateshwarlu chundi, Siva reddy challa , Devala rao garikatapati, Giridhar juvva , Anusha jampani, Sree harsha P, Sahithi P, Journal of

									ayurveda and integrative medicine 2016 oct-dec, 7 [4]: 231-237.14.
3	Diadzein	Clove	Myrtaceae	Putative Anti Dipsotropic	Syrian golden hamsters	150-230mg/kg	150,230 mg/kg	<0.05	Keung WM, vallee BL., Proc.neil.acadamy of science USA vol.90, Nov 1993 pp-10008-10012 biochemistry. [15]
				Hypotensive / Vasodilator	SD rats	10,20,40mg/kg	20,40mg/kg	<0.05 <0.01	Yong-xiao cao, xiao-jiang yang, jing liu,ke-xi li, Basic and clinical pharmacology and toxicology 99[6] 2006, PP 425-430. 16.
4	Formononetin	Sunflower seed	Asteraceae,umbelliferae	Acute MI treatment	Male SD rats	5,10,20mg/kg	10,20 mg/kg	<0.05 <0.01	Zheingxin huang , yingfeng liu, xianping huang, molecular medicine repots , vol.18, issue.6, Dec 2018, pp-4821-4830. [17].
				Anti hypertensive	SD rats	5,10,20mg/kg	10,20mg/kg	<0.05	Tao SUN, Riu LIU, Yong-xiao cao, acta-pharmacologica sinica 32(8), 2011 PP 1009-1018. 18.
				Anti resorptive / relieve post	Female Wistar rats	0.1,1,0,10 mg/kg	10mg/kg	<0.05	Weronika . W , Maria Z,Ewa ozimina-kaminshka, Joanna .

				menopausal osteoporosis		g			T,agata.S, eveidence based complementary and alternative medicine, vol. 2013 ,2013, pp-10. 19.
5	Apigenin	Parsley	Apiaceae / Umbelliferae	Inhibition of melanoma growth	Female C57BL/6N mice	50,25,12.5 mg/kg	25,50mg /kg	<0.0001	Sara .C,Cosmo.R,Andreina .P,International journal of cancer, vol.87, 2000, issue 4, 595-600. 20.
				Anti-tumour	Female mice	75,150mg/kg	75,150mg/kg	<0.05	Jun he , Qing xu, Min wang, Chongyong li, xu qian, zhumei shiling-zhi liu, bing-hua jiang ,ij of molecular sciences 13, volume 6, 2012, 7271-7282. 21.
				Mammary Adenocarcinoma treatment	[BALB/CA-nu[nu/nu]]mice	300mg/kg	300mg/kg	<0.01 =0.01	Layla hashim alol,kahtan ahmed al-mzaien, shalal murad Hussein , jphysiol biomed sci, 2012: 25(1):5-12. [22].
6	Chrysin	Celery	Apiaceae	Analgesic	Male wistar rats	50,100,150 mg/kg	150mg/kg	<0.01	Cherkaoui-tangi k, phytotherapy res.2668, march [22] [3], 356-61. 23.
				Diuretic , laxative, hypotensive	Adult male Wistar	1-3mg/kg	2.5mg/kg	<0.01 <0.001	Cherkaoui - tangi k, phytotherapy res.2668, march (22) (3) 356-61.

					rats and Swiss albino mice				24.
7	Luteolin	Capsicum	Solanaceae	Anti-cancer	Nude mice / SD rats	3.3mg/kg	3.3mg/kg	<0.05	Dabatosh M, kyung-ho Jung, Sreenivas .N, Dong M.Shin , cancer prevention Reaserch 7(1), 2014, 65-73 . 25
				Alzheimers disease	Wistar rats	10-20mg/kg	10,20mg/kg	<0.05	Huimin .W, Huiling.W, huixin.C , Zhengyong che, Molecular medicine reports 13[5], 2016, pp-4215-4220. 26
				Cerebral ischemia	Male Wistar rats	70-700mg	70mg	<0.05	Carlo.C, carlo cisari, stroke study, Translational stroke research 7[1], 2016, pp-54-69. 27
8	Tricetin	Pepper	Piperaceae	osteoarthriti s	STR/ort mice	10-80micro mol	10-20 micro mol	<0.001 <0.01	Sandipan D, Sanjay dey, Supratik chaudary , Bhaskar mazumder , Expert opinion on drug delivery , volume 10, issue 4, 2013, pp-411-420.28
9.	Quercitogenin	Citrus	Rutaceae	Anti inflammato	Mice	10,50,100,	10micro g/ml	<0.05	Souad.A, Dalila .B, Dalila.S ,korrochi.L,

		peels		ry and anti -oxidant activity		500,1 000m icro g/ml			IJGP, vol.no.3[2010], PP-165-169.29
10.	Resveratro l	Grap e / pea nuts	Rafflesiac ea / Legumino sae/ Fabacae	Anti Leukaemic	Male C3H[H- 2k]mice	8,40, 80mg /kg	80mg/k g	=0.103	Xiaohua.G, yong X.Xu, George.D, Nalini janakiraman, Robert A.Chapman, Subash .C Gautam, The Journal of nutrition , vol.132, issue 7 , july2002, pg-2076- 2081 30.
11.	Secoisolai riciresinol	Flaxs eed	Linaceae	Cardioproct ive / Liginin productions	Mouse , female SD rats	3- 8mg/ kg,1. 1,2.2, 4.4mi cro mol	3mg/kg 2.2micr o mol	<0.01 <0.05	Gencel.B, Benjamin.M, Bahou, Khalil.A, mini reviews in medicinal chemistry, vol.12, issue no.2, 2012 , pp-149- 174.31
12.	Pinoresino l	Sesa me seed / Rye bran / Oat bran	Poaceae	Anti- inflammato ry	mouse	12.5- 100m g/kg	12.5,100 mg/kg	<0.05	Hyun .L, Jong gu lee , Sueng ho lee, Yeong Shink Kim, Hyun Po Kim , Journal of ethno pharmacology , vol.118[issue-1], 2008 , pp-113-117.32.
13.	Sesamin	Sesa me	Martyniac eae/	Anti- Inociceptiv	Male wistar	50,10 0,200	200mg/ kg	<0.001	Erika MHM, Lucas.AC, Orlando viera de Sousa,

		seed	Pedaliacea	e and Anti-inflammatory.	rats	mg/kg			nutrients 2014; vol.6, issue 5, Pp: 1931-1944. 33.
				Anti-Hypercholesterimic	SD rats	0.2%,5%,10%	0.2%	<0.05 =0.05	Rogi T, Tomomori N, Ono Y , Kiso Y, Journal of Pharmacol sci. 2011; volume 115,issue3, Epub .2011, Mar 2, 408-16.34
14.	Lariciresinol	Rye bran / oat bran	Poaceae	Prevention / decrease of mammary tumour	Rats	3-15mg/kg	3,15mg/kg	<0.05 =0.05	Niina M Saarinen, Anni warri, Ruud PM dings, Maarit A, Annika I smeds , Sari makela, International journal of cancer vol. 123, issue 5, 2008, 1196-1204. 35 .
15.	Syringaresinol	Rye bran	Poaceae	Vaso relaxation	mouse	30micrometer	30 micrometer	<0.01	Byung-hee chund, Sooken kim , young meyong kim, Experimental and molecular medicine 44[issue-3], 2012, pp-191-201. 36.
16.	Matairesinol Hydroxymatairesinol	Sesame seed	Glutenacea	Anti-allergic	BALB / c mice	10-100microlit	20 microlit	<0.01 <0.05	Yoon young sung, yeong A lee, Ho kyoung kim Journal of ethopharmacology 187, 2018, 49-56. 37.
		Wheat		Anti-cancer	Male athymic	0.15ml,0.	0.30ml	<0.05	Bylund A, Exp boil med (Maywood). vol. 203:

		bran , oat bran, brale y bran		e BALB/ CA bom strain	30ml			April 2005, 217-23. 38.	
				Anti- osteoporoti c	Male ICR mice	10mi cro meter 100m icro meter	10 micro meter	<0.05	Sik-won choi, Kie-in park, Seong hwan kim , BMC complementary and alternative medicine vol.14, issue, 2014, pp- 35. 39.
17.	Coumestro l	Mung beanns or soy sprouts, alafalfa sprouts, clove	Fabace ace, Legumi noseae	Anti osteoporoti c maintain GNRH release	Female wistar rats	0.4 or 1.6m g per h 2.4m g / h	2.4mg / h	<0.05	Mc garvey C, Ctes PA , Brooks A, Swanson IA, Iligan SR , Coen CW , O’Byrne KT, Endocrinology volume 142, issue 31 st march 2001, page 1202-1208. 40.

Advantages: Help reduce or prevent certain type of cancers. Treat atherosclerosis. Helps counteract the hormonal imbalance that occur during menopause to preserve or enhance health. The phytoestrogen genistein fight obesity. Phytoestrogens in alcoholic beverages have been reported to improve premature ejaculation and increase libido. 41

Disadvantages: High phytoestrogen diets seem to reduce the occurrence of pregnancies and may decrease sperm levels. Early consumption could lead to hormonal imbalance later in the life. Low concentration of certain phytoestrogens may make cancers grow fast. Dementia and cognitive decline with phytoestrogen intake. [42]

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