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Pinoresinol: A potential Biological warrior in edible foods.

Chaitali.Y.Mathew[1]
[1](*yadav3015@gmail.com, PhD scholar, Mats University, Raipur,C.G,India*)

Abstract:*-Phenylpropanoid are most extensive group of secondary metabolites. This pathway includes production of flavinoids, tannins, lignins, lignans etc. Secondary metabolites are produced from few precousor unit of building blocks. Four major lignans are found in edible foods pinoresinol, lariciresinol, secoisolariciresinol and matairesinol. Pinoresinol are furofuran lignans .Pinoresinol exhibits diverse bioactive properties such as antioxidant, anti-inflammatory, anti cancer, hepatoprotective, and many others. The aim of this work is to review general database of pinoresinol and its edible source.*

Keywords*: anticancer, edible foods, hepatoprotective,pinoresinol.*

I. Introduction

Lignans are generally two polypropanoid units which are linked together by their β,β' carbon atoms at 8,8' position. C3C6 units are propyl benzene and numbered 1-6.and propyl groupare numbered as 7-9 starting from benzene ring. On basis of chemical structure lignan can be of four types Neolignans, Oxyneolignans :Sequineolignans(IUPAC,Moss 2000), Norlignans Willow (J.H.Liu; John Wiley & Sons, march 2011) and Oligomeric lignans. Their presence had been detected in gymnosperm, pterydophytes and angiosperms and their types vary from species and concentration varies from plant parts in which they were present (Milder IE, Arts IC, van de Putte B, et al. 2005, Smeds AI, Eklund PC, Sjöholm RE, et al.2007 , Peñalvo JL, Adlercreutz H, Uehara M, et al. 2008)

According to Chemical Entities of Biological Interest database definition " Pinoresinol is a furfuran type lignan that is tetrahydro-1H,3H-furo[3,4-c]furan substituted at positions 1 and 4 by 4-hydroxy-3-methoxyphenyl groups". 4α-hydroxypinoresinol has functional parent pinoresinol. Its molecular formula is $C_{20}H_{22}O_6$. (+)-pinoresinol first dirigent protein was discovered in Forsythia intermedia. This protein has been found to direct the stereo selective biosynthesis of (+)-pinoresinol from coniferyl alcohol monomers (Davin LB, Wang HB, Crowell AL et al. (1997).pinoresinol are oil soluble lignans. Glucoside derivatives of pinoresinol, pinomonoglucoside, pinodiglucoside, pinotriglucoside had been studied. Pinoresinol are biosynthesize by coniferal alcohol monomers. (Davin LB, Wang HB, Crowell AL et al. (1997).

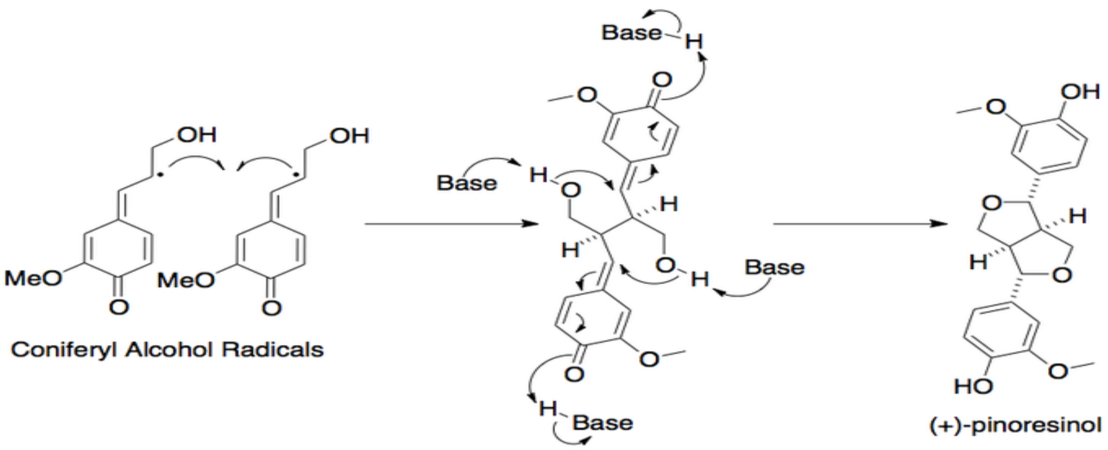

Fig 1 : Formation of pinoresinol from monolignol radicals in presence of dirigent proteins.
(commons.wikimedia.org/wiki/File:(%2B)-Pinoresinol_Biosynthesis.png**)**
The aim of this work is to review general database of pinoresinol and its edible source.

Table 1 : Pinoresinol in edible plants

Food source	Total µg/100gm
Cereals	
Barley(W.G)	72
Buck wheat(W.G)	92
Millet	85
Oat((W.G)	194
Rye(W.G)	381
Fruits	
Grapes	28
Kiwi	8
Lemon	185
Oranges	9
Nuts and Seeds	
Cashew	1.1
Almond	9
Chestnuts	5.6
Pistachio	31.2
Flax seed	2460
Sesame seed	47136
Vegetable and Legume	
Asparagus	49
Cucumber	1
Eggplant	28
Radish	2
Tomato	5

W.G* indicates whole grain

Data compiled from Adlercreutz & Mazur (1997),Kunle et al (2009),Mazur et al (1996), Mazur (1998),Mazur et al (1998),Milder et al (2005), Penalvo et al (2005),Penalvo et al (2008), Smeds et al (2007),Thompson et al (1996), Thompson,L.U.Boucher, Liu.Z.Cotterchio, M and kreiger,N.Nutr Cancer; 54,184,2006)

Metabolism of lignans :

Pinoresinol and furfuran type lignans, are known to be converted by gut microflora to mammalian lignans, enterolactone or enterodiol (Heinonen S, Nurmi T, Liukkonen K, et al.2001; Adlercreutz H.2007; Axelson M, Sjövall J, Gustafsson BE, et al 1982).

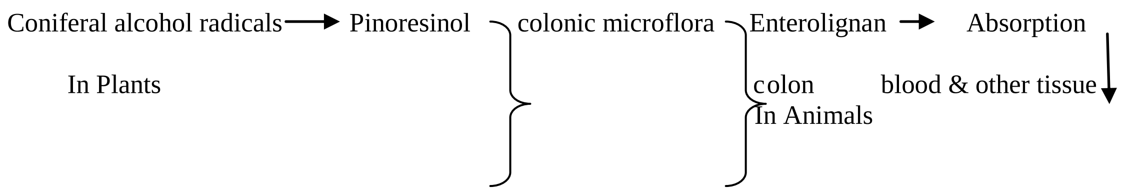

Fig 2 : Possible pathway of metabolism of pinoresinol from plants to Animals

Bioactive properties:

Antioxidative and Anti-inflammatory

KPI and KP2 are the first lignan diglucosides possessing two glucose residues at the 4' position, this type of lignan glucoside showing antioxidative activity by itself.(Katsuzaki, H., Kawasumi and et al 1992,1993,1994a,1994b). 8-hydroxypiniresinol glycoside and 8-hydroxypinoresinol showed high antioxidant properties (Piccinelli AL, Arana S, Caceres A, et al 2004) Pinoresinol has the strongest anti-inflammatory, it exhibited the strongest anti-inflammatory properties by acting on the NF-κB signalling pathway, possibly in relation to its furofuran structure and/or its intestinal metabolism.(During A et al 2012) . Pinoresinol glucoside of prunes had antioxidant and anti inflammatory properties (Kikuzaki H, Kayano S, Fukutsuka N, et al.2004;

Cho JY, Kim AR, Park MH 2001; Cho JY, Park J, Yoo ES, et al.1998). 4-Ketopinoresinol of adhlay also shows antioxidant properties (Kuo CC, Chiang W, Liu GP, et al 2002).

Hepatoprotective (Kim HY and et al.2011) the hepatoprotective effects of pinoresinol, a lignan isolated from Forsythia Fructus, was studied against carbon tetrachloride (CCl(4))-induced liver injury.

Neuroprotective Action

Oral administration of 9-hydroxypinoresinol and its glycoside, petaslignolde A, showed a protective effect on the seizure and mortality caused by kainic acid(Cui HS, Kim MRand etal.2005.2007). In addition, these lignans successfully prevented the loss of the GSH peroxidase activity and the lipid peroxidation in brain tissue, which was exposed to kainic acid, an excitotoxin. In comparison, 9-hydroxypinoresinol, a metabolite of petsalignolide A, was more effective than its precursor glycoside, petaslignolde A in preventing kainic acid-induced neurotoxicity (Sok DE, Oh SH, Kim YB, et al 2005, 2006,2007). Under the same condition, quercetin or pinoresinol. Thus, peatslignolide A and its aglycone, 9-hydroxypinoresinol seems to have antioxidant activity in brain tissue, and therby exert a neuroprotective effect. Thus, are usefully used in the prevention and treatment of neurodegerative diseases.. The aglycone hydroxypinoresinol displayed more powerful antioxidant activity than pinoresinol. Likewise, aglycone 9-hydroxypinoresinol was more potent than its precursor,petaslignolide A (Sok DE, and et al 2007.). Thus, the antioxidant action of pinoresinol derivatives depends on the number of hydroxyl group in the structure.

Other properties: Ant repellent: Schroeder, F. C.et al. (2006) studied antirepellent activity of pinoresinol in pieris rapae.

Future prospects: This review summarizes pinoresinol , its structure ,sources in edible foods. An outline of possible metabolic pathway in plants and animals . pinoresinols exhibits bioactive potentials and their clinical capacity are yet to be proved through extensive studies. Thus we can say use of pinoresinol in future medicine shows new promises aganist promising potential.

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