



## REVIEW ON FLAVONOIDS TO TREAT DIABETES

<sup>1</sup>Varsha Lokhande, <sup>2</sup>Sayali Wagh, <sup>3</sup>Yogita Dekhane, <sup>4</sup>Varsha Shejul, <sup>5</sup>Dr. Gajanan Sanap

<sup>1</sup>Student, <sup>2</sup>Lecturer, <sup>3</sup>Student, <sup>4</sup>Student, <sup>5</sup>Principal

<sup>1</sup>Pharmacy,

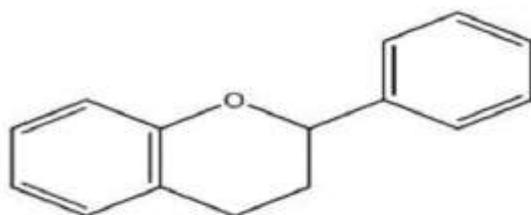
<sup>1</sup>Late Bhagirathi Yashwantrao Pathrikar Collage Of Pharmacy, Aurangabad, India

**Abstract :** For thousand of year, natural food is used as studied. In the biomedical technologies, natural products they have attracted substantial public attention in the area of drug discovery. This review a medicine systematically summarizes the use of common flavonoids for the treatment of diabetic. Since several investigation of flavonoids derivatives performed the plant origin, and the biological activity extensively. Basically flavonoids are naturally collected from the phenolic compound that are distributed in plants. The flavonoids are consist biological activity or to more research has shows the potential role in the cure the diabetes or the or some diseases. Flavonoids are able to the stabilizing, improving, insulin secretion, human islet and pancreatic cell respectives. Diabetes together with its various difficulty, is turn a earnest threat to human health. The major potential benefits of natural flavonoids discussed in this review clearly suggest that these substances are lead compounds with enough structural diversity of considerable important in the antidiabetic drug developing process. Diabetes s is a prevailing global health .diabetes is characterized by the elevation of blood glucose due to the defect in insulin synthesis, secretion, binding, to receptor, or an increase of insulin resistance.

**KEYWORDS:** Diabetes mellitus, flavonoids, lipogenesis, kaempferol, hyperglycemia, insulin metabolism.

### Introduction

Flavonoids are the polyphenolic compounds that are omnipresent in nature and are categorized, per chemical structure, into flavonols, flavones, flavanones, isoflavones, catechins, anthocyanidins and chalcones. Flavonols ar phytochemical compounds found in most quantity in numerous plant based mostly foods or the libation. Supported their arrangement, flavonols category is flavonoids and embrace the compounds found in most quantity in numerous plant based mostly foods or the libation. Supported their arrangement, flavonols category is flavonoids and embrace the compound: myricetin, kaempferol and quercetin over 4,000 flavonoids are known, several of that occur in fruit, vegetable and beverages(tea, coffee, beer, wine and fruit drink). The flavonoids have aroused of their potential helpful result on human health they need been rumored to own antiviral, antiallergic, antiplatelet, medication, growth and inhibitor activities. Flavonoids are divided within the anthocyanins and anthoxanthins. The flavonoids bioactive phenols with the low relative molecular mass and gift the role of the within the cell synthesis. Polygenic disorder describes a gaggle of metabolic diseases during which the person has high blood sugar either as a result of the body's cell don't respond properly to internal secretion or both. Duct gland manufacture internal secretion per the blood sugar level. Polygenic disorder causes vary betting on your genetic makeup, case history, ethnicity, health and environment issue. Theres no outlined polygenic disorder cause as a result of the causes of polygenic disorder vary betting on the individual and therefore the kind. Polygenic disorder may be a disorder ends up in symptom and hindrance in saccharide, protein and metabolism leading to underprivileged internal secretion profile.



1. Basic chemical structure of a flavonoid.

fig.1

**FLAVONOIDS AND DIABETES:** Diabetes is a complicated metabolic disorder. It is a association with insulin resistance, harmed insulin signaling, adnormalgiucose level and change lipid metabolism. It is also linked to sun- clinical inflammation and raised oxidative relaxation. Theses metabolic disorder lead to long-term pathogenic infectious sickness involve micro and macro vascular complexity, neuropathy, retinopathy, and consequently, decrease aspect of life and improve estimate of mortality. Linked to their biological properties, polyphenols may be useful nutraceuticals and completing therapy for various mien of diabetes mellitus. Based on the in vitro animal models and some human studies, polyphenols may play a role in many metabolic process. They can modulate carbohydrate and lipid metabolism, attenuate hyperglycemia, dyslipidemia and insulin resistance, enhance adipose tissue metabolism, and alleviate oxidative stress and stress- sensitive signaling pathways and inflammatory processes. Investigation to high spot the most latest papers that have attract on the relationship between flavonoids and main diabetic complexity.

**Table No 1:**

FLAVONOID SUBCLASS	DIETARY FLAVONOIDS	SOME COMMON FOOD SOURCES
Anthocyanidins	Cyanidin	Red, blue, and purple berries; red and purple grapes; red wine
Flavanols	Monomers (Catechins): Catechin, Epicatechin, Epigallocatechingallate Dimers and Polymers: Proanthocyanidins	<b>Catechins:</b> Teas (particularly green and white), chocolate, grapes, berries, apples <b>Thearubigins:</b> Teas (particularly black and oolong) <b>Proanthocyanidins:</b> Chocolate, apples, berries, red grapes, red wine
Flavanones	Naringenin, Eriodictyol	Citrus fruit and juices, e.g., oranges, grapefruit, lemons
Flavonols	Quercetin, Myricetin	<b>Widely distributed:</b> yellow onions, scallions, kale, broccoli, apples, berries, teas
Isoflavones	Genistein	Soybeans, soy foods, legumes

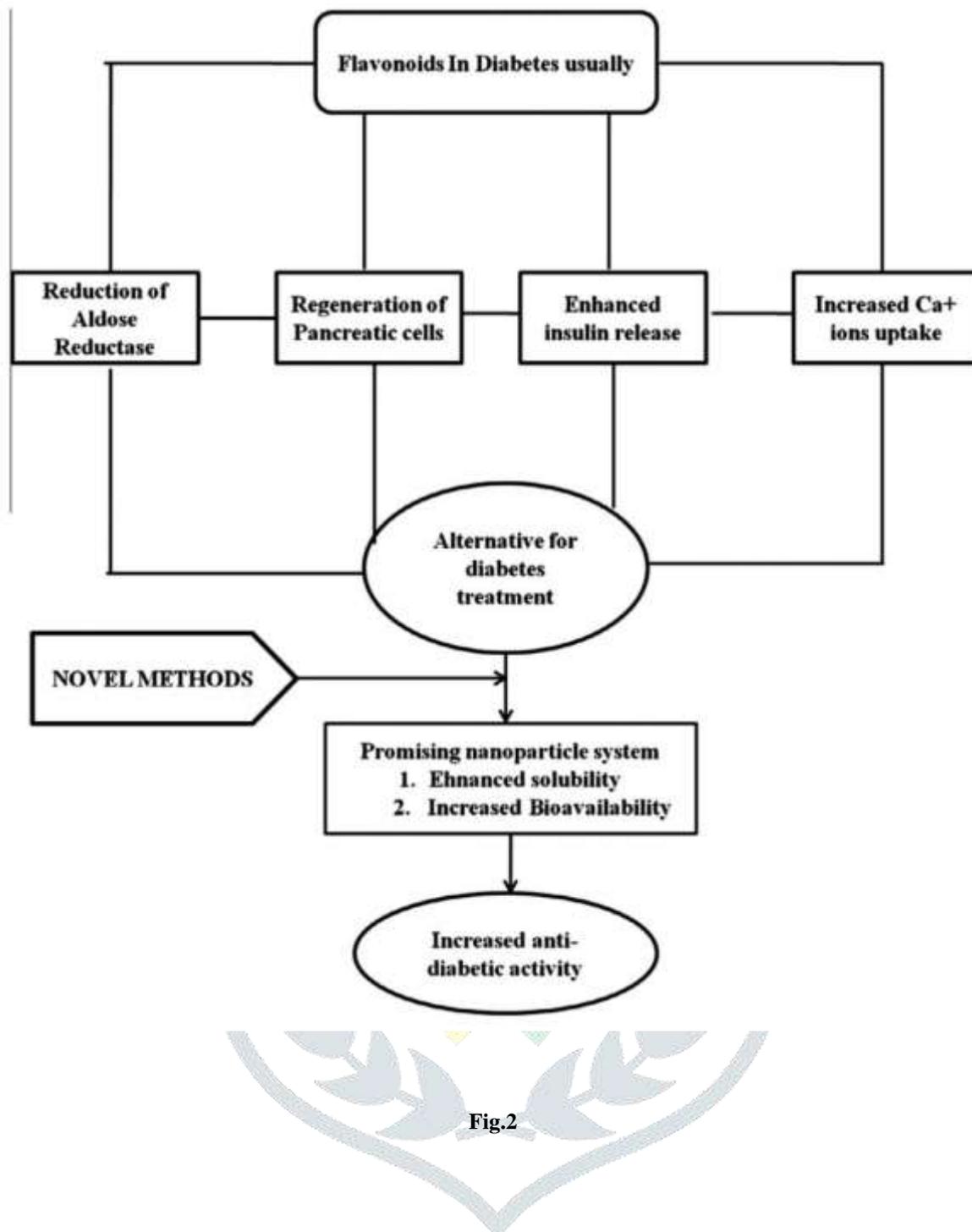
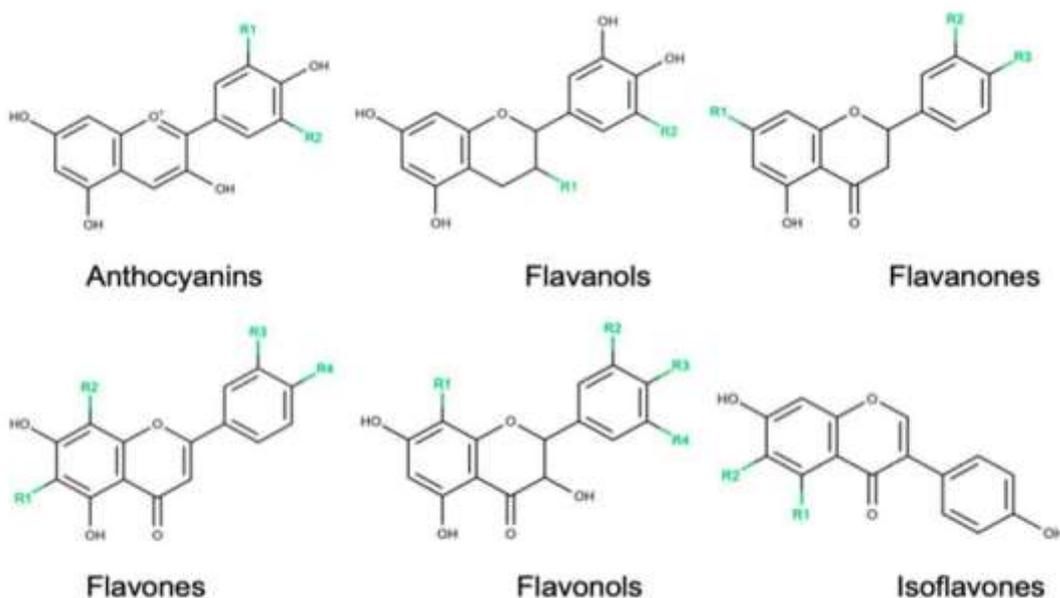


Fig.2

**MOLECULAR MECHANISMS OF INSULIN RESISTANCE:** the molecular levels, the mechanism underlying insulin resistance are being explored. Several mechanisms including exceptional insulin manufacture, alteration in insulin receptor and its substance and insulin adversary have been proposed, but it is now clearly known that defect in post-receptor beckoning are the major cause of insulin support in target tissues. Decrease declaration, diminished tyrosine phosphorylation, or extension degeneration of early insulin motioning molecule have been implicated. Serine/ threonine phosphorylation of IRS protein can inhibit their activity and block downstream signaling. Many kinases contain pressure initiate protein kinase, c-jun N- terminal kinase (JNK), inhinator of nuclear factor kappa B (NF-Kb) kinase(IkB), and protein kinase c (PKC)can phosphorylate IRS-1 and 2 at particular serine and threonine remainder, guide to constrain of insulin signaling. Increase action of phosphatases which dephosphorylate medium signaling molecules can also discourage the insulin signal pathway. Handful phosphate have been incriminate as liability of insulin action. Protein tyrosine phosphatases (PTP1B) have negative influence on insulin waving and are indicate to be great ordinance of insulin signaling. Other phosphates such as phosphatase and tensin homologue (PTEN) which passive PI3-K and SH2 containing inositol 5' phosphatase- 2 (SHIP 2) have been shown to have a negative role on insulin signaling.

**FLAVONOIDS AND THEIR EFFECT ON DIABETES:** : flavonoids personify an oversized category of a minimum of 6000 phenolic resin compounds found in fruits , vegetable, nuts, grain seed, cocoa, chocolate, tea, soy, red wine, herbs and potable products. Flavonids incorporates two aromatic ring associated degree connected by a 3-carbon chain that forms an aerated ring.

Flavonoids contain six subclasses they're flavones, flavanols, flavanones, flavonols, isoflavones and anthocyanidins this are supported the variations in generic structure of the C ring, purposeful teams on the rings and therefore the position at that the B ring is hooked up to the C ring. Inside every taxon, separate compounds are outlined by specific hydroxylation and conjugation patterns. Flavonoids that have the flexibility to scavenge free radicals and chelate metals. Given the hypothesized relation between polygenic disease inflammation and therefore the potential for flavonoids to safeguard the body against free radicals and alternative pro-oxidative compounds, it's biologically plausible that consumption of flavonoids or flavonoid-rich foods could cut back the chance of polygenic disease. New conceptions have emerged with this trend, like nutraceuticals, organic process medical care, phytonutrients and botanical medicine. These perform foods or phytomedicines play positive roles in maintaining blood sugar levels, aldohexose uptake and endocrine excretion regulate immune performance to avoid specific. In the past year completely different approaches are created to exercise the flavonoids in vitro and in vivo models by integrated few novel ways to raise its antidiabetic drug activity.

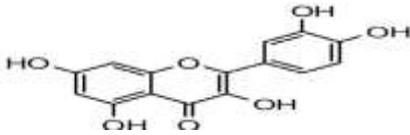
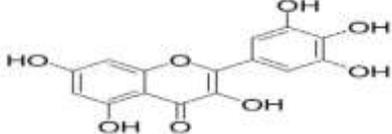
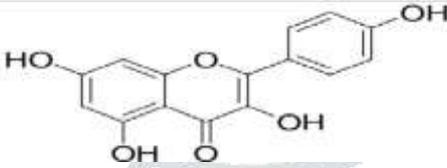
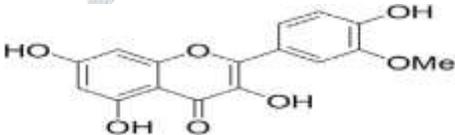


**Fig.3 Chemical structure of flavonoid subclass**

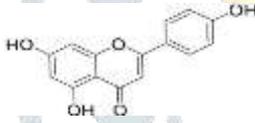
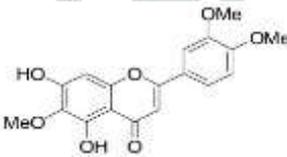
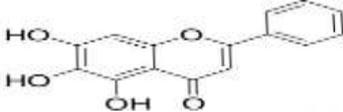
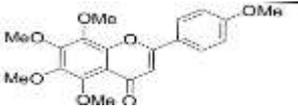
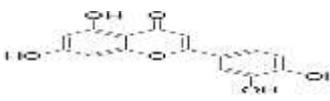
#### **DIABETIC RETINOPATHY AND THE BENEFITS OF FLAVONOIDS:**

Polyphenols, chemically characterized as compounds with phenolic structural features, comprise one of the most numerous and widely dispersed groups of natural products in the plant kingdom. This group of regular commodities is highly disparate, and consists of several sub-groups of phenolic compounds. Flavonoids, one polyphenol sub-group that account for about 60% of all polyphenols, can be found in fruits and vegetables with particular biological characteristics that include anti-inflammatory, antiviral, and antioxidant effects. Flavonoids can be classified into six classes according to their chemical structure, namely anthocyanins, flavanols, flavonoids, flavonols, and isoflavones. Flavonoids can regulate carbohydrate and lipid metabolism, increase insulin resistance, attenuate hyperglycemia, increase cell function, and management of inflammatory processes, which could help to prevent the development of long-term chronic diabetic complications, such as diabetic retinopathy.

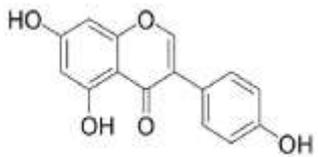
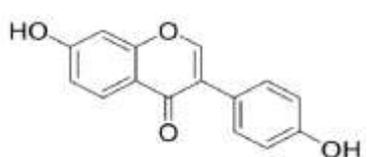
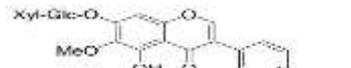
## MECHANISM ACTION OF NATURAL FLAVONOIDS FOR THE TREATMENT OF DIABETES FLAVONOLS:

Flavonoid	Structure	Mechanism
Quercetin		protection of $\beta$ -cells from damage preservation of $\beta$ -cell mass promotion of glycogen synthesis inhibition of $\alpha$ -glucosidase
Myricetin		activation of glucose transport stimulation of glucose uptake promotion of glycogen synthesis inhibition of sucrase, maltase and $\alpha$ -amylase
Kaempferol		protection of $\beta$ -cells from damage inhibition of sucrase, maltase and $\alpha$ -amylase
Isorhamnetin		inhibition of $\alpha$ -glucosidase

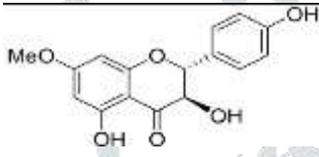
## FLAVONES:

Apigenin		protection of $\beta$ -cells from damage
Eupatilin		enhancement of pancreatic $\beta$ -cell function to increase insulin
Baicalein		stimulation of glucose uptake
Tangeritin		stimulation of glucose uptake
Luteolin		Inhibition of $\alpha$ -glucosidase, $\alpha$ -amylase

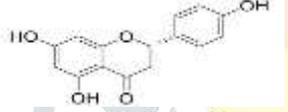
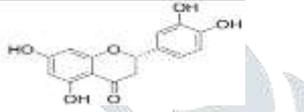
**ISOFLAVONES:**

Genistein		protection of $\beta$ -cells from damage proliferation of islet $\beta$ -cells stimulation of insulin secretion insulin-receptor signaling inhibition of G-6-Pase reduction of breakdown of glycogen
Daidzein		activation of glucose transport reduction of breakdown of glycogen
Kakkalide		insulin-receptor signaling

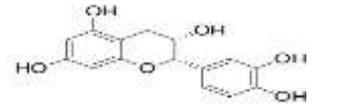
**FLAVANONOLS:**

7-O-Methylaromadendrin		stimulation of glucose uptake
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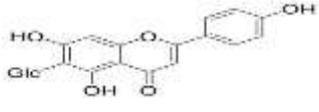
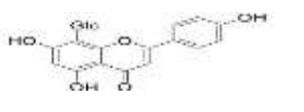
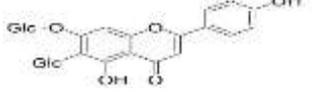
**FLAVANONES :**

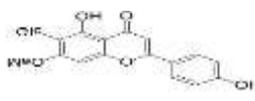
Naringenin		inhibition of $\alpha$ -glucosidase
Eriodictyol		stimulation of glucose uptake

**FLAVANOLS:**

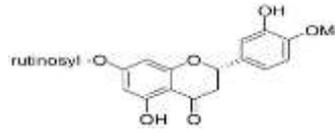
(-)-Epicatechin		protection of $\beta$ -cells against oxidative stress
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**FLAVONE C- GLYCOSIDES :**

Isovitexin		inhibition of $\alpha$ -glucosidase
Vitexin		inhibition of $\alpha$ -glucosidase
Apigenin-6-Cglucosyl-7-Oglucoside		inhibition of $\alpha$ -glucosidase

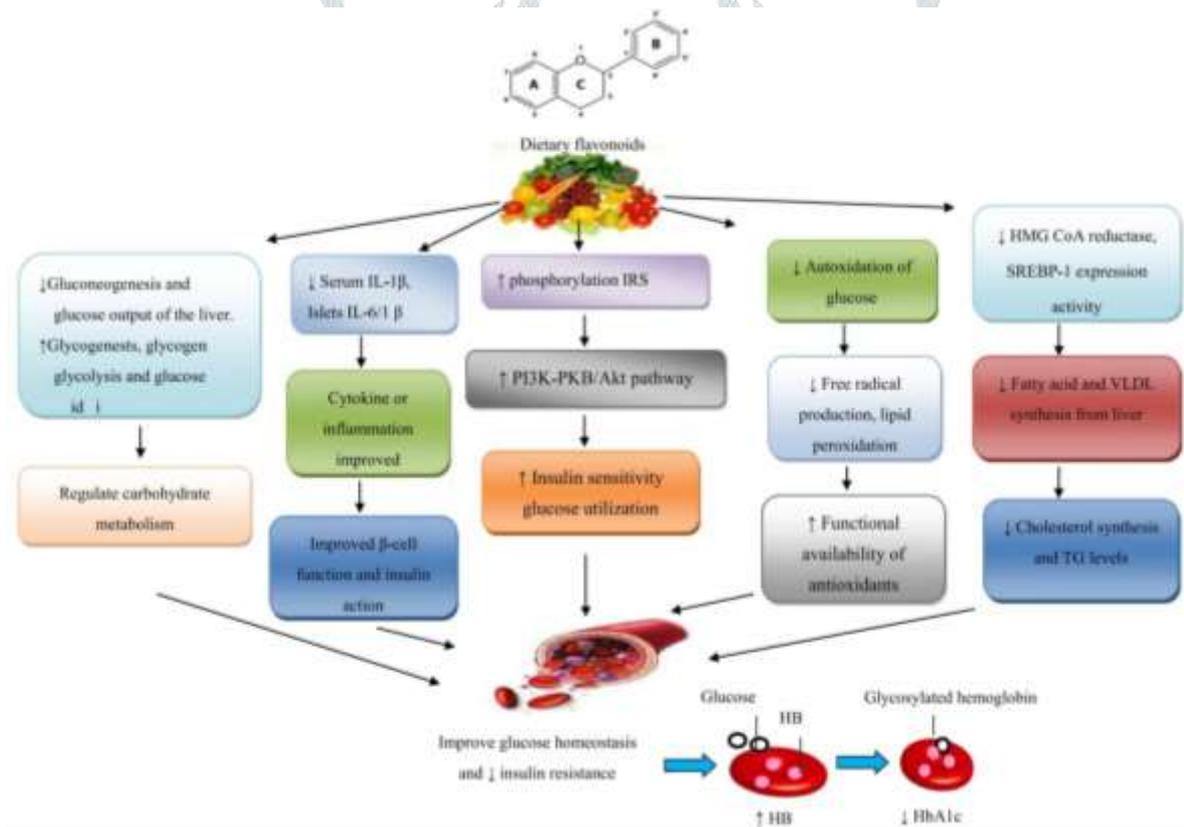
Swertisin		inhibition of $\alpha$ -glucosidase
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**FLAVANONE GLYCOSIDES :**

Naringin		inhibition of G-6-Pase reduction of breakdown of glycogen
Hesperidin		inhibition of G-6-Pase reduction of breakdown of glycogen

**CONCLUSION:**

The article that reviewed shows the positive role of flavonoids in the diseased diabetics. They reduced the diabetics. This review showed the focused on the describing the different type of flavonoids and shows their mechanism action of reducing diabetes. Flavonoid improve the pathogenesis of diabetics and it's complications through the regulation of glucose metabolism hepatic enzymes activities and a lipids profile. Diabetics mellitus is growing to epidemic proportions leading to devastating complications if not treated well. There are many challenge in the successful treatment of diabetics mellitus. Because of personal and economic cost incurred in diabetics therapy. Diabetic is a serious life threatening diseases and must be constantly monitored and effectively subdued with proper medication And any adapting to a healthy lifestyle.



**RESULT:**

Flavonoids reduce complications in addition to their vital role of effective supplement for preventing diabetics mellitus by regulating glucose metabolism lipid profile, liver enzyme activity, a protein kinase inhibitors, PPAR and AMPK with NF- $\kappa$ B

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