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# Reactions of Plants Antioxidant Systems for Protecting Human against Oxygen Radicals

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**ABSTRACT**

The proactive kinds of oxygen are produced constantly in human and plants and for example they are by- products of metabolic reactions. Based on Ros proactive oxygen kinds or with attention to Ros kind or proactive oxygen kinds , they are very toxic compositions. Ros cause changing in ceu compositions and damaging to ceu. Ross react to cellular biomolecules severely and they can oxidate every kinds of cellular and vital compositions. This article is about elision of free radicals by herbaceous antioxidants, function mechanism of Ross, special attention to proactive kinds of oxygen and interactions between antioxidants. The most important and effective herbaceous anti oxidants are also discussed.

**Key words:** Ros (Reactive oxygen species), anti oxidant Plant/human.

## INTRODUCTION

**How are the oxygen radicals formed?**

When plants faces with severe environmental tensions like sever light, high temperature and dryness and saltiness tensions, ultra violet tensions and pathogens attacks, the equilibrium between tensioned proactive oxygen kinds and hushing activity of Ross by antioxidant indisposed that lead to oxidative tension.

**Production resources of proactive oxygen kinds in plants**

Generally the molecular oxygen is relatively unreactive and this unractivity is related to spatlia form of electrons and filling arrangement of oxygen molecule's orbitals. Activation of oxygen in the first stage is a revive and it is an energy-related process and also it needs an e giver.

Following the first stage, the next stages of revive and addition of next electrons is not an energy related process and it occurs automatically but it needs an e giver.

**From wikipedia-diradical**

The produced singlet oxygen is proactive and is ready to react with molecules and biomolecules that are contained e and negative load like lipid protein biomolecules and nucleic acid of DNA and through this makes irreparable damages on cell. In biological systems mean metal ions like $Fe^{+}$ and $Cu^{+}$ and quinines work. As electron giver. If oxygen molecules receives it electron and different places of ROS production if it receives 2 electron, it transforms to super oxide free radicats, Hydrogen peroxide, destructive radicals of hydroxine, singlet oxygen.

**Production mechanisms of ROS in the plants and the mammalian**

A , productions mechanism Ros in the plants biological systems is reported by two enzymic and nonenzymic systems. Generally important positions of ROSs production inckude mitochondria, chloroplast, praxizom, plasma membrane and to plast.

Chloroplast: limitation of $Co_2$ stabilization

under some conditions lead to declining of carbon revive amount via calvin cycles and also declining of $NADP^+$ level that play a role as e receiver in photosynthesis, so released e of photosystem I encounter with oxygen instead of pherodoxine and the transform to superoxide radicals. This process is starter of destructive reactions of ROS production. This process becomes the starter of ROS production chained reactions. And by continuation of this reactions, the free radicals production will increase. Therefore any factors in plants like lack of $Co_2$ , high light, therm, dryness and saltness can exit e transmission from natural status and lead to producing free radicals in chloroplast. $H_2O_2$ fatty acids produced as a by- product in beta oxidation in proxizoms.

Lipoxygenases: action of lipo- oxygenases is another resource of ROS and other radicals in a cell.

They cause hydroperoxidation of ploy unsaturated fatty- acids (PUFA) . Hydroperoxidation of PUFA lead to producing free radicals and beginning of chained reactions of lipids peroxidation PUFA are important compositions of mambraneous lipids that are so sensitive to peroxidation.

Lipo – oxygenases mediate the forming of singlet oxygen and superoxide. Hydromine radicals and singlet oxygen can react with methylen ploy unsaturated fatty acids and form peroxylipid radicals and hydro peroxide. ROS production works as signaling and defensive. System against pathogens attacks in plants. So not only ROSs are beneficial but also they have some profits for cells. Provided that ROS production amount in cell doesn't exceed from normal amount.

**ROS production places and free radicals in human**

1 Respiratory chain- work in mitochondria
2 Drugs and poisons revive cycle
3 Face cytose
4 Alcohol consumption
5 Heavy enercise
6 Stress and agitation
7 Smoking

**Proactive oxygen kinds in human are like plants**

Hydrogen peroxide- superoxide- hydromine radicals and singlet oxygen.

**Oxidation of biomolecules in human**

**A : Proteins**

1 Creation of carbon? Groups
2 Breaking of proteins chain- work

**B: fats**

1 lipid peroxidation of fats

**C: nucleic acid : breaking of DNA molecules and stress oxidative cause these pathologic processes in human**

**A : nervous abnormality**

Amnesia and powkinson and Ms.

**B: Respiratory disease**

**Asthma,**

**C: vessel**

Cardiac disorders: or terit is destruction of vessels, and apoplexy

D: cancer
E: old age
F : G: inflammation

Superoxide is necessary for producing anion and it is show in table 52-4 (reactions). In this system, revide of single electron oxygen to anion of superoxide is catalyzed and required NADH is provided by direction of phasphatic pantase that its activity increased very much during stranger eating- this reaction is accompanied with automatical production of hydrogen proxide from two superoxide molecules.

$$O_2 + O_2 + 2\,H \rightarrow H_2O_2 + O_2$$

Superoxide anion is offloaded to out of cell or in fagolysozynes and faces to bacterias in these places. It seams that bacterias killing in fago lysozymes depends on synthetic reaction of high PH super oxid ion with other derivations of oxygen ($H_2O_2$, OH , HOCL , hypochloroacid) and reaction of some peptides of defensions bacterias and other proteins like G and same cationic proteins in stragerating cells. NADH oxidase inactive in rest

mode in strangerating cells. And it becomes active viqexisted receivers in plasma membrane after connecting with various ligands (csa piece and canotoeletefic peptides and ….) Hocl that is a component of home- madder withing liquid , is a strong oxidant and is highly microbicide. The potential of its damaging decreased when it isusing for natural tissues. Because it produces various devivations of nitrogen – chlorine after reacting with existed first and second amins. These chloroamins are oxidant to but it has lower power relative to hod and uses as microbicide factor (for example in disinfecting wounds) without making any tissue damage (resource: harper biochemistry, 52 chapter). If is interesting that antioxidant system decreases the severity of ROSs by poly amins in plants. Polyamins of putricine – spermidine and spermine are produced in exposed to tension and decreases ROSs production severity . Reseavches are shown that biosynthesis of polyamins in plants are as a component of plants response to oxitative tension. It is reported in 2004 that significant increase seen in supported figures of spermine and spermidine in two species of wheat by dryness stress with PEG. Similar results reported on tomato in 1998 ( resource: poly amin tension)

**Dangers of ROS in cell**

ROS cause damaging to Proteins , lipids and DNA. ROS effects on lipids are in this way that when ROS react with unsaturated fatty acids cause membrane proxidation and finally cause leakage of cell contents outside of it and early dryness and finally mortality of cell. Oxidative atlacks on proteins lead to changing of special amino acids places and cutting fof peptide chain- works and increasing of proteolyses. ROS can induce various damages on DNA molecules.including: deletion, leaping and other killing genetic changes-it is determined that plants which can produce highlevel of oxidant have moreresistant against oxidative damages. High power of her baceous tissues in gathering enzymatic defense against peroxidatione of membrane lipids is an important opposition of bearing totension. Gained discoveries of last decades showed that some activating of defensive responses exist in living cratures like E.cali.activation of these defensive mechanisms lead to keeping alive of living creatures after the next oxidative tensions.

**Antioxidant systems in human**

A : proteinaceous antioxidants
Thermal shock proteins, HSPs(chaperons)
Metal- connected proteins
Teransferrine

**B: Non proteinceous antioxidant**

Dissolve din water wicacid , bilirubin, Goenzyme and her baceous compounds,folic acid, fenolic acids, flavonoids and green tea extract.
Dissolved in fat: vitaminE, carotenoids

**Antioxidants systems in plants**

Plants are developed sufficient antioxidants that can protect plant against ROS catastrophe. ROS effects are controlled by enzymic and nonenzymatic antioxidants in plants. These antioxidant systems include:

1 Antioxidants with low molecular weight like ascorbic acid , topcopherol , flavonoid, alkaloid, cartenoid.
2 Antioxidants thatreacted with ROS which are:

Superoxid (SOD) , catalase (CAT) , ascorbate peroxidase (APX) GR that can delete ROS.

Naturally any part of her baceous cell contain something morethan one enzymic activity. Which are able to furbish ROS effects. Forexample are contained of minimum 3 system or enzymic activity (APX , GPX, PRXP) that are able to delete H2O2.. biomedical importance of vitamin E as an antioxidant in human : (Harper)

Vitamin E is a herbaceous food group thatare needed in low amount for doing biochemical activities. Generally vitamines cannot synthesise in body and they should be in foods. Vitamin E is an important antioxidant its main activity is its antioxidant rolein cellular member and plasma lipoproteins that romoues radicals augmentation and traps free radicals. This vitamin reacts with lipid peroxide radicals that are resulted from perxidation of fatty acids with several twofold links. The production of tocopheroxin free radicals are relatively non reactioxary and they produce unradical compounds at last. Usually tocopheroxin radical revived by a reaction with plasma vitamin C with tocopherol. Stabiligy of tocopheroxin free

radicals means that it can transpire intocells and increase by choined reaction. So like other antioxidants vitamin C may has peroxidation activity especially in high density. This can justify that why is the effect of high dose of vitamin E unpromising despite the fact that studies show the existence of correlation between high amount of vitamin E in blood and appearing of ? (harper). The gist is that extra consumption of vitamine E cause encreasing of cholesterol in blood and probability of heart attack. But the lack of vitamin E cause some problems too. Patients that have wrong absorbant of fat and some forms of chronic liver disease are in lack of vitamin E . because they arenot able to absorb this vitamin that is dissolved in fat ant they show men brane damage of nerve and muscle.prematurenewborns that are born with low amounts of vitamin E are faced with abnormal frangibility dueto peroxidation of red glonule's membrane and this leads to hemolytic anemia.

Superioxide (Sod) , catalase (CAT) and gluthation are antioxidants that participatein protecting of red globules of blood against oxidative stress and damage. Daving metabolism, several strong ixidants are produced in blood red globules and other cells of body. These oxidants include superoxide $O_2$ , hydrogen peroxide $H_2O_2$, proxin radicals Resalted from fats peroxidation (author) (ROO) and hydroxin radicals (OH). Among these hydroxin radical (OH) is an active and reflexive molecule that can reacts with biomolecules like proteins , nucleic acid, lipids and other molecules, and cause changing of their structure and creating tissue damage. Listed reactions in table 52++ have an important role in creation and consumption of these oxidants. New we study every one of these reactions sequencely.

Superoxide in blood red globule is produced by hemoglobin oxidation to Hb (reaction 1). It is estimated that daily about 3% of existent hemoglobin in human red globules is oxidated automatically and in other tissues this anion is produced by activity of enzymes like PH so cytocrum, redoctace and gesantain oxidase and in the time of stimulus shows a respiratory burst due to connecting to bacterias and nutromins. And it is produced superoxide by NADPH oxidase reaction (reaction 2). Super oxide disintegrated automatically to produce H2O2 and O2 . Although this reaction speed increased very mach by superoxide Dismutase enzyme (reaction 3) , hydrogen peroxide has different hensities. Existent catalase enzyme in different calls disintegrated hydrogen peroxide to H2O and O2 (reaction 4). There is a anique enzyme named miloperoxidase in nutromins that produce hypohalid acids by consuming H2O and halids (reaction 5) . gluthation peroxidase enzyme produce oxidated gluthation (GSSG)and H2O with effect on revived gluthation and (GSH) and H2O2 . Also this enzyme can uses other proxides as substra OH and OH- can be produced during a nonenzymic reaction and they are catalyzed by fe+2 (fenton reaction 7). O2- and H2O2 are substras for haber – weiss reaction (reaction 8) that this reaction produce OH destructive hydroxin radical (auther). Super oxid is able to abandon fe from ferritin. So OH production may be one of the mechanisms that interfere in tissue damages resulted from tron- overload in hemochromatosis. Chemical compounds and reactions produced species with oxygen poisan potention can be named proxidant.

In the other hand , the compounds and reactions that use, sweeping or repress these species of ROS or oppose with their action are antioxidants. These compound, include NADPH, GBH, ascorbic acid and vitamin E . there is a suitable equilibrium between peroxidant: oxidant in anormal cell. Although in some cases of increasing of oxygen sepecies production for example after eating some chemical materials of taking some drugs or in the time of decreasing of antioxidant materials, this equilibrium chang toward peroxidant. This is called oxidative stress that causes serious damage to cell in cases of vast and long stress. Today it is believed that oxygen species have an important role in many of cell damages (for example because of prescription of toxic chemical materials or because of eiskemy )

That leads to death in some cases. Supporting in direct evidence of these species role in creating cellular damage is obtained when by enzymic prescription like super oxide dismutase or catalase, cellular damage of under investigation are protected. Antioxidant attribute of ascorbic acid (vitamin C) in plants is one of the most imoortant and powerful nonenzymic anti oxidants of vitamin

C that exist in most of herbaceous cells, organs an ioplast. Ability of vitamin C in giving e in extensive range of enzymic and nonenzymic reactions , makes ascorbic acid as one of the most important ROS poison brush off compound. Ascorbic acid can delete directly superoixde radicals, hydroxyl, and singlet oxygen. H2O2 is transformed to water by ascorbic peroxidase reaction. Also ascorbic acid can revive to copheral from tocopheroxine radical that is important in protecting cellular membrane also ascorbic acid play o role in nonenzymic actions like regulation of cellular division, or advancing of cellular cycle from G to S and growing of cell.

**Phenolic compounds**

Phenolics are of secondary metabolists of plants which are involved flavonoids ;tanene and asferhydroxi cinamat that are found in herbaceouse tissues very much . poly phenols have special chemical structure for deleting free and poison radicals and it is determind in- vitro that they are antioxidants that are more stronger that tocopherol and as corbat. Phenols anti oxidant features are resulted from 1. their high reflexive as an e giver or hydrogen.

Their ability to clatherate with poison and mean metal ions.

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