Opinion

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Hepatotoxicity from Paraquat Dichloride and the Beneficial Effects of Nutritional Supplements

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Hepatotoxicity from paraquat dichloride and the beneficial effects of nutritional supplements

The possible hepatotoxicity of paraquat dichloride (PQ) and the ameliorative effect of some dietary supplements were investigated in this study. For three weeks, male Wistar albino rats were given a sub-lethal dose of paraquat dichloride (1.5 mg/kg body weight) intraperitoneally on alternate days, as well as nutritional supplements (glutathione, vitamin C, and garlic).

Assays of serum Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT), Alkaline Phosphatase (ALP) activities, and determination of bilirubin, total protein, and albumin concentrations were used to determine the hepatotoxic and protective effects of PQ and nutritional supplements, respectively. Total antioxidant capacity, malondialdehyde, and glutathione concentrations were used to measure oxidative stress and antioxidant status.

PQ administration caused an increase in AST, ALT, and ALP activity, as well as an increase in serum bilirubin and a substantial decrease in albumin, indicating hepatic dysfunction. The ability of PQ to cause oxidative liver damage is confirmed by a significant increase in the lipid peroxidation product Malondialdehyde (MDA), as well as a decrease in glutathione concentration and overall antioxidant capacity. However, the results demonstrated that vitamin C and garlic were beneficial in protecting against paraquat-induced toxicity when taken orally. The mechanism of PQ's harmful effects, as well as the role of vitamin C, garlic, and glutathione in preventing or lowering these toxic effects was thoroughly examined. Vitamin C and garlic, it is believed, may be useful antioxidants in the treatment of PQ-induced toxicity.

Paraquat dichloride (PQ) is a broadleaf weed control pesticide that is non-selective. It is widely employed in current agricultural practise around the world and is fast gaining traction in Nigeria's agricultural economy. Paraquat accumulates in the lungs, liver, kidneys, and heart of humans and farm animals, making it harmful to both humans and farm animals. Animal exposure can occur as a result of inadvertent or deliberate ingesting, as well as damaged skin or inhalation. Chronic paraquat exposure has been linked to lung and liver damage, kidney failure, and Parkinsonian abnormalities, in addition to fibrosis, according to studies.

Excessive generation of free radicals causes paraquat toxicity, resulting in oxidative stress and damage. The redox cycle produces superoxide radical (O_2•–), which then produces hydrogen peroxide (H_2O_2) and hydroxyl radical (HO–), resulting in toxicity. Oxidative stress can harm molecular structures and cell function, and it's linked to a variety of diseases. The body's natural defence system and/or antioxidants ingested in the diet can, however, reverse the negative effects of free radicals. Garlic, glutathione, and vitamin C are antioxidant-rich foods and food components.

Garlic (*Allium sativum*) is a flavorful vegetable that is also utilised in herbal medicines. Allicin, Sallylcysteine, and allylcysteine are all good sources of selenium, iodine, arginine, Vitamin C and B6, as well as allicin, Sallylcysteine, and allylcysteine. Allicin is an organosulfur molecule that is unstable and quickly degrades into a variety of sulfur-containing compounds such as Diallyl Sulphide (DAS), Diallyl Trisulfide (DAT), and Disulfide Derivatives (DADS), among others.

Allyl disulfide protects cells from microsomal lipid peroxidation, allylcysteine is a powerful scavenger of hydroxyl radicals (•OH) and peroxyl radicals (ROO•), and allicin can scavenge hydroxyl radicals and prevent lipid peroxidation. Garlic organosulfides components (DAS, DADS, and DAT) have been found to modulate the GSH-related antioxidant system in distinct ways. Furthermore, the organo sulphides DAS, DADS, DPS (dipropyl sulphide), and DPDS (dipropyl disulfide) from garlic promote NAD(P)H expression. Glutathione (GSH) is an antioxidant that can protect important cellular components from oxidative damage caused

by free radicals, peroxides, lipid peroxides, and heavy metals. The cysteine thiol group in glutathione can transfer a reducing equivalent (H++e) to other molecules, such as reactive oxygen species, to neutralise them in a reduced state. Glutathione reductase reduces oxidised glutathione (GSSG) in the presence of an electron donor (NADPH). Vitamin C is a good reducing agent and antioxidant that contributes electrons to a variety of enzymatic and non-enzymatic activities.

NADPH-dependent Enzyme processes and cellular and extracellular glutathione concentration keep semi-dehydroascorbic acid and dehydroascorbic acid in a reduced state. The increased use of pesticides for agricultural production, weed control, and crop yield improvement has led in unpleasant chemical deposits in soil, plants, and water sources as a result of indiscriminate use. Pesticide residues are ingested by mammals via the water supply and the food chain. Because systematic exposure causes gradual deterioration and potentially deadly lesions in mammalian tissues and organs, paraquat toxicity in mammals has become a focus of research in recent years. As a result, the hepatotoxicity of paraquat dichloride was assessed, as well as the ameliorative effect of several nutritional supplements.