SAFFLOWER OIL- A BOON TO HEALTH

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ABSTRACT

Dietary fats requirement in relation to growing heart problems in present days has been reviewed. None of the vegetable oils has ideal Omega-6(α-linoleic)/Omega-3 (linolenic) ratio of 4:5. Although safflower oil has high level of Omega-6 (70 -75 %) fatty acid, its autoxidation in vitro causes serious problems. This autoxidation of polyunsaturated fatty acid may be reduced by increasing the level of tocopherol (Vit-E), particularly the gamma-tocopherol. Recombination breeding in safflower involving lines, such as, CR-39 and CR-41 (having high gamma-tocopherol content) and blending safflower oil with other oils (rice bran, corn oil, mustard oil, flaxseed oil, sesame oil, etc.) needs intensive researches.

Key words: Safflower oil, Omega6/omega3 ratio, Heart diseases.

As per world health organization (WHO) report of 2009 about 17 million people die annually due to CVD, particularly heart attack and strokes (Atherosclerotic heart disease and others). The heart attacks are mainly due to increased level of cholesterol in blood and lifestyle problems. There are two types of lipoprotein in blood cholesterol: Low Density Lipoprotein (LDL-Bad cholesterol) and High Density Lipoprotein (HDL-Good cholesterol). Cholesterol is harmful to health (Guangwei and Dajue, 1999).

Although dietary fat is an important source of energy, its imbalance and poor quality intake in diet causes increase in cholesterol level in blood leading to heart problems. Dietary fat available in two forms: visible fat (e.g. cooking oil, ghee (animal fats), vanaspati (vegetable fats), butter, margarine, etc.) and invisible fat (e.g. wheat, rice, pulses, nuts, potato chips, eggs, cheese, fat meats, fruits and vegetables etc.). Daily fat intake should not be more than 50g/day (ICMR, India recommends 30-35g fat and oil per unit per day; Kumar, 2005 and Rao, 1987). Recently ICMR, India annual reports 2007-08 recommended fat and oil 22 g/day/head. Food contains dietary fats in different forms, which are grouped into three classes, Saturated Fatty Acid (SFA), Monounsaturated Fatty Acid (MUFA) and Polyunsaturated Fatty Acid (PUFA). PUFA includes Linoleic acid (LA: Omega-6) and Alpha Linolenic acid (ALNA: Omega-3). These cannot be synthesized in human body but have the structural and functional roles in the cells and are therefore, known as Essential Fatty Acid (EFA). Thus PUFA have to be included in diet.

Both MUFA and PUFA are associated with lowering blood cholesterol. In affluent countries, research linking health and diet has increased the demand for the oil, which has the highest polyunsaturated/saturated ratio of any oil available. During the last three decades, there has been a major shift away from animal fat to vegetable fat (Kumar,2005). At global level the shift has resulted in a modest reduction in saturated fat intake.

Of the several vegetable oils, safflower oil has the highest ratio of PUFA/SFA. Investigation by the National Institute of Nutrition (NIN) has shown that Hypocholesterelenic activity in safflower oil is-16 followed by- 12 in sunlower oil i.e. the content of cholesterol in blood of those that took safflower oil declined by 16% as compared

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to 12% in persons taking sunflower oil (Vissani, 1987). The safflower oil is also considered a vasodilator, a substance that causes vessels to open up (Duke, 1997).

The problem with such type of vegetable oils (safflower, sunflower having high PUFA) has been in vitro oxidative degradation of PUFA contained in them, limiting greatly their shelf-life. MUFA are however, resistant to such an oxidative degradation and hence oils rich in MUFA (Olive oil, high oleic safflower and sunflower) decay very slowly during storage. Results from clinical trials, as also some epidemiological data, suggest that diets containing MUFA are associated with decreased mortality from cardiovascular diseases (Tondon and Praksh, 2001).

Prevention of Oxidative Deterioration

The oxidative deterioration of seed oil with high PUFA can be prevented by enhancement of production of natural antioxidant by the seeds. Tocopherol (Vit E) is an antioxidant compound present in vegetable oils. They occur as alpha-, beta-, gamma- and delta-tocopherols, which differ in their ability to protect oils from autoxidation. Safflower seeds contain moderate levels of tocopherol (34.1 mg/100g) (Fernandez-Martinez and Velasco, 2002). Alpha-tocopherol exhibits a high vitamin E activity, but a low ability to protect the oil in vitro i.e. after it has been extracted from the seeds. The increase of total tocopherol content combined with a partial replacement of alpha-tocopherol by another tocopherol (gamma-tocopherol) will lead to greater in vitro antioxidant activity. Spanish scientists have been able to breed a few safflower lines with increased level of gamma-tocopherol (CR-39 and CR-41) with greater in vitro antioxidant property as compared to normal variety (Fernandez-Martinez and Velasco, 2002).

Moreover, Vit E is to help protect the integrity of cellular and intra-cellular components. As an important antioxidant, Vit E retards the sedimentation of fats in food and in the digestive tract and protects cells from infection of toxic substances formed from the oxidation of unsaturated fatty acids.

Ratio of Omega-6/Omega-3

Studies (Anonymous, 2001; Tondon and Praksh, 2001) have shown that intake of one fatty fish meal (rich in Omega-3) per week such as, 80 g of Salmon fish or 5.5 g of Omega-3 (Apha-linolenic acid) of PUFA per month reduces the risk of primary cardiac arrest by 50%. Further, two populations with lowest coronary artery disease mortality in the world-Japanese from ‘Kohama’ island and ‘Cretans’ from Crete- both have high intake of alaphalinolenic acid. Omega-3 has also been shown to be anti-inflamatory and analgesic for joints. Thus, it came to be accepted that an appropriate ratio of Omega-6 to Omega-3 PUFA for reducing the risk of coronary artery disease should be 4:5.

In most of the vegetable oils including safflower oil, this ratio is much higher. Even in mustard oil this ratio is around 12:10. In zero erucic acid line of mustard, with the decline of erucic acid there is an increase in oleic and linolenic acids; the amount of linolenic (Omega-3) remained more or less unchanged. This leads to Omega-6/Omega-3 ratio close to 10:5, which is still very high from the ideal ratio of 4:5. Similar situation exists in double-zero lines of mustard also.

Blending of Oils to Improve Quality

Intensive researches on the blending of safflower oils with others (rice bran oil, corn oil, mustard oil, flaxseed oil, sesame oil, etc.) and addition of tocopherol (Vit E), as a value addition; to further improve the safflower oil is the need of the hour. In this connection use of lines with increased level of gamma-tocopherol (CR-39 and CR-41 developed in Spain) and their exploitation through recombination breeding involving lines with high values of Omega-3 may lead to development of safflower genotypes that would yield most ideal vegetable oil for the people suffering from coronary artery diseases. It is best to take safflower oil blended with flaxseed or other oils rich in Omega-3 EFAs in order to have EFA-balanced oil for the diet.
REFERENCES