

Extracts of Kashmiri Saffron in Service to Human Race and Present Ground Realities

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ABSTRACT

The Kashmir valley is well known for producing high quality of saffron (*Crocus sativus* L.) and represents one of the major saffron-producing areas of the world. Saffron has been traditionally used in preparation of indigenous medicines and also as a dye. The extracts of the parts of saffron plant is being used in cosmetics and in many drugs to cure different ailments. In present document the potential role of the saffron and its parts cultivated in Kashmir valley and the diseases like cancer to be cured from them are being discussed. Concerns on the low production rate due to urbanization and shrinking of the cultivated land and probable adoptions to be implemented to avoid the loss of economy are being discussed.

Kew words: Kashmir, Saffron, Cancer, Treatment, Crocin, Mechanism, Apoptosis.

INTRODUCTION

Cancer represents the largest cause of the mortality, which claims over 6 million lives each year, in present world (Abdullaev 2012). Insensitivity of cancer types to most of the oncological therapies such as chemotherapy, radiotherapy and immunotherapy (Ghaneh *et al.* 2007, Sarkar *et al.* 2007) has forced to strengthen new therapeutic strategies to combat this deadly form of disease. A promising strategy to cure cancer is chemoprevention through natural agents. Natural agents, extracted from diverse sources like that of plants, had been extensively used for curing many ailments including cancer. Natural products and related drugs are used to treat 87% of all categorized human diseases infectious and non-infectious (Chin *et al.* 2006). Molecular epidemiological studies have provided evidence that an individual's susceptibility to cancer like diseases is modulated by both genetic and environmental factors via. their interaction and their affect on enzymes involved in the metabolism of

carcinogens (Gattoo *et al.* 2011). Chemoprevention may act to cure cancer as per the possible mechanism illustrated in Fig. 1. One of the constituents which have shown the results of inducing apoptosis is Crocin (Fig. 2) extracted from the Kashmir Saffron, *Crocus sativus* L. (Bakshi *et al.* 2010)

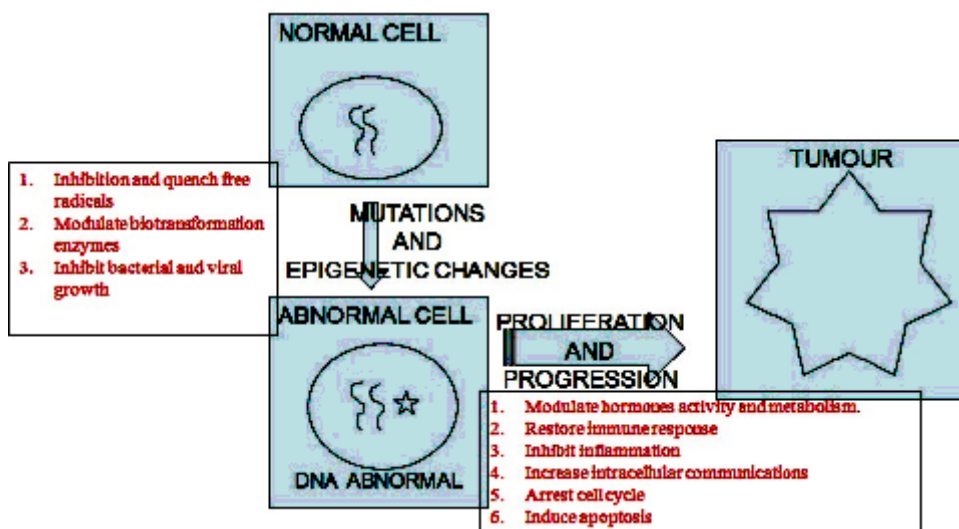
Outline of Kashmiri Saffron

Kashmir, one of the biotic provinces of the Himalayas, supports a rich and unique floristic diversity, including at least 450 known medicinal plants species (Jabeen and Kozgar 2011) including saffron. Saffron is cultivated commercially to limited extent in India and mostly confined to this part (Kashmir), however, it is also found to be cultivated in Azerbaijan, France, Greece, Iran, Italy, Spain, China, Israel, Morocco, Turkey, Egypt, and Mexico with high commercial cost outputs (Negbi 1999). In Kashmir saffron cultivation is mostly seen in the table-land of Pampore, at the outskirts of Srinagar city, which is well known for quality saffron and represents one of the major saffron-producing

areas of the world, and infact some authors reflect that the saffron originated from Kashmir from where Phoenicians introduced it to the Greek and Roman world (Alberini 1990; Winterhalter and Straibinger 2000) and to Britain world in XIV century (Caiola and Canini 2010).

Constituents and usages of Kashmiri Saffron

Saffron belongs to the iris family (Iridaceae) and constitutes different chemical agents like crocin, crocetin anthocyanin, carotene and lycopene (Abdullaev and Espinosa-Aguirre, 2004), especially in its stigma parts of the flower



(Modified from Steinmeta and Potter 1996; Kelloff *et al.* 2000; Lampe 2003)

Fig. 1: Possible mechanisms for chemoprevention by the extracts of medicinal plants

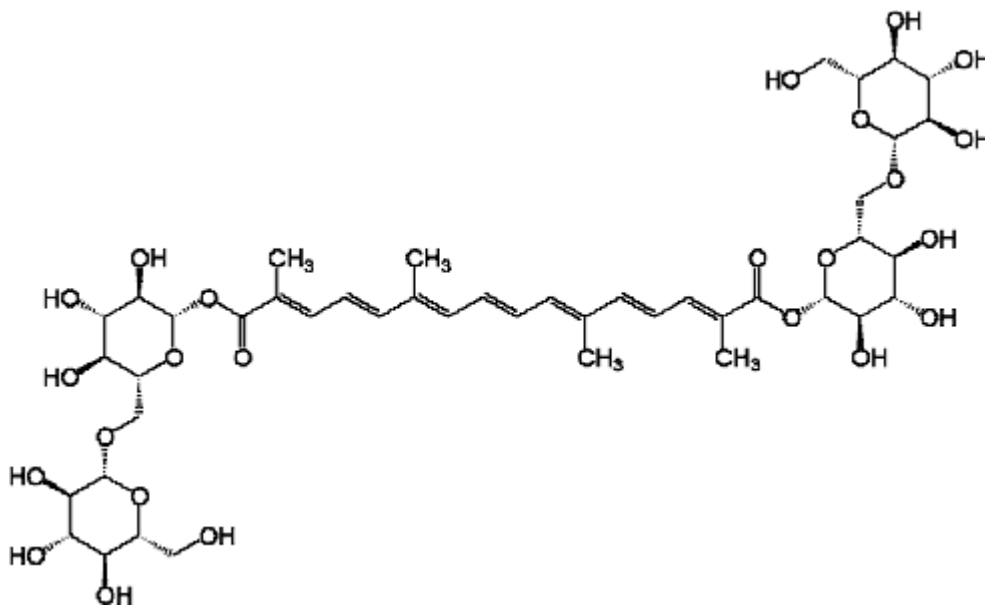


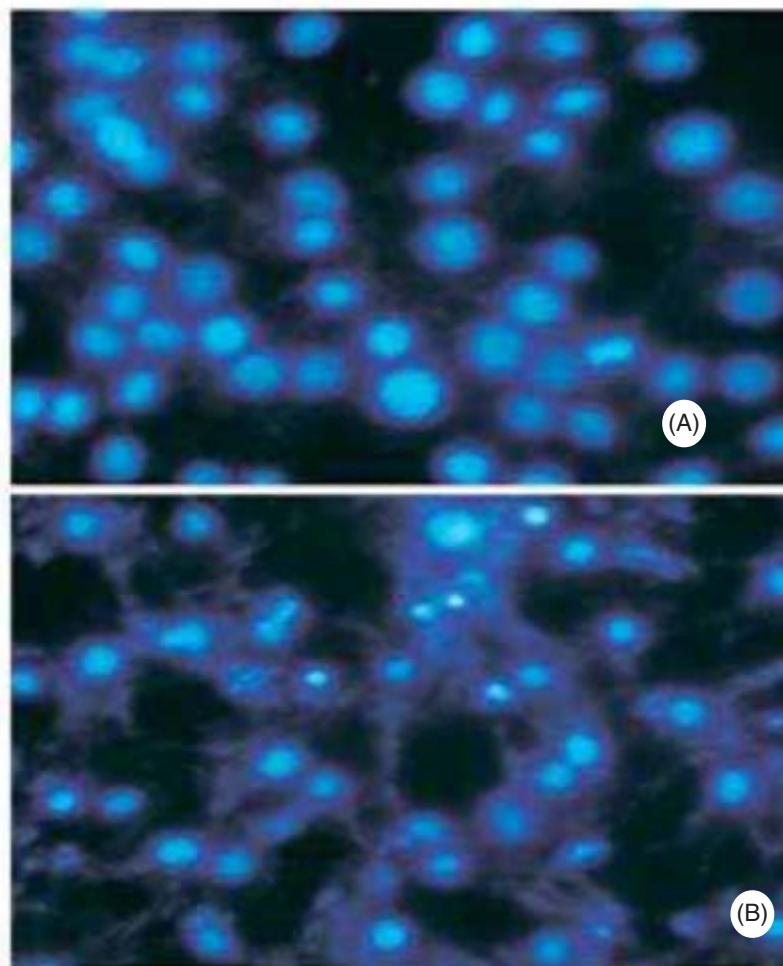
Fig. 2: Chemical structure of Crocin

(Giaccio et al., 2004). These constituents are known to have various usages in relation to health related problems. They have pharmacological effects on different illness, including anti-tumor effects by inhibition of cell growth (Abdullaev 1993, Dhar *et al.* 2009). Bakhsi *et al.* (2010) has demonstrated that the crocin extracted from the saffron cultivated in Pampore belt of Kashmir vale has potential role in inducing cell cycle arrest and henceforth could play a key role in cancer treatments (Fig. 3). In addition, the extract of this saffron has also revealed to inhibit cell proliferation (Fig. 4) and modulate signal transduction. All these factors viz. inducing apoptosis, inhibit proliferation of cell and/or

modulating signal transduction are currently used in cancer treatment and Guzman (2003) reported that the combination of multi-chemopreventive agents or agents with multiple targets is considered to be more effective than a single agent.

Cultivation problems and strategies for exploring saffron sustainably

Over than three decades from now the land under cultivation of saffron in Pampore (Kashmir) region is shrinking rapidly due to encroachment of local people. Increase in urbanization and presence of anthropogenic pressures are other problems. In addition, the

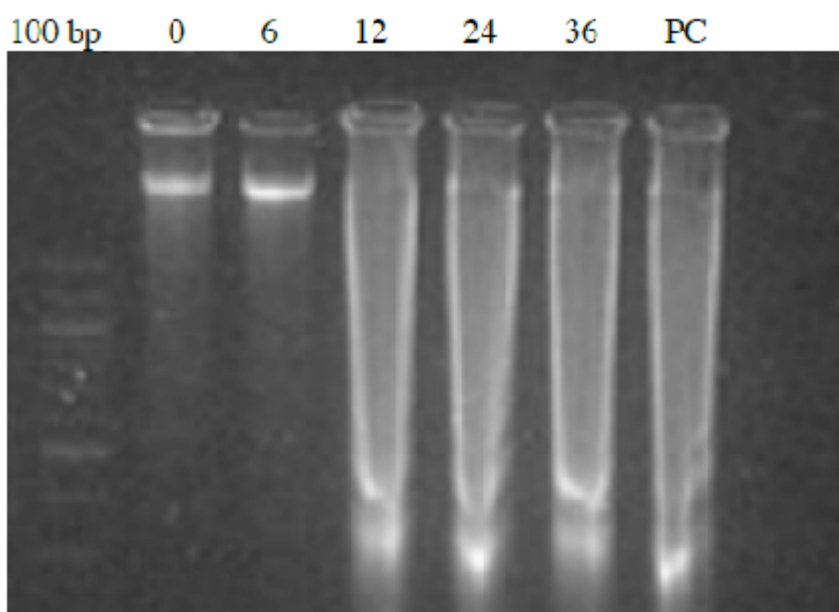


Morphology of apoptotic cells control (a) vs treated with crocin (b) Hoechst stainx400
(Adopted from Bakhsi et al 2011; Permission granted for using from Journal Editorial Office and also from Main author)

Fig. 3: Induction of Apoptosis and Cell Cycle Arrest

genetic diversity is not upto so much extent in this particular plant as it reproduces vegetatively through corms. Due to absence of ample genetic diversity saffron plants are constantly under siege by a multitude of disease-causing organisms including bacteria, fungi, viruses and nematodes (Ahrazem *et al.* 2010). In addition, limited availability of daughter corms is also one of the major handicaps for the expansion of acreage under saffron (Sharma and Piqueras 2010).

In order to get full benefit from the extracts of the saffron plant of Kashmir cultivated one, various techniques and sustainable approached has to be introduced. Techniques like induced mutagenesis and tissue culture has to be implemented and reserving the land for its cultivation has to be promoted. Cultivation in indoor pots and promotion of its cultivation in kitchen gardens has to be enhanced. Hussiani *et al.* (2010) has advocated the need for using quality planting materials and a sprinkler irrigation system as one of the major means to enhance the production.



BxPC-3 cells (HPCL) treated with 10 µg/mL crocin (extracted from saffron) for 0,6, 12, 24, 36 h, induced DNA fragmentation in time dependant manner from 12 hours. Actinomucin D for 36 h was a positive control (PC) at a concentration of 10 µg/mL (Adopted from Bakshi *et al.* .2011; Permission granted for using from Journal Editorial Office and also from Main author)

Fig. 4: Agarose gel electrophoreses demonstrating DNA fragmentation

CONCLUSION

In order to obtain high economy from the saffron parts grown in Kashmir new areas should be covered under cultivation. Analysis of different constituents and their probable applications in the healthcare using cutting edge techniques, in a sustainable way, be promoted from all corners. Looking for procedures and their amplifications

should be increased, which directly or indirectly enhance the genetic diversity among the cultivars of saffron. Encroachment in the field of saffron cultivated belt, either for domestic life or for commercial purposes, should totally banned. Biophysiological studies for various types of stresses especially cold stress be analyzed to develop the variety resistant to cold, which is mostly following the later stages of saffron growth period.

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