

Benefits of Saffron (*Crocus sativus*) in the Management of Menstrual Disorders: A Review

Debby Endayani Safitri and Nur Setiawati Rahayu

Nutrition Study Program, Faculty of Health Sciences, University of Muhammadiyah Prof. DR. Hamka, Jakarta, Indonesia

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Abstract: Menstrual disorders are common problems which can occur in various symptoms, such as abnormal period, heavy bleeding, menstrual pain, and psychological problem. It causes interference with women's daily activity. Many studies used saffron as a treatment for menstrual disorders. Saffron has a beneficial effect on the management of menstrual disorders. The benefit can be obtained through oral consumption or inhaling its aroma. This is a literature review about the benefits of saffron and the possible mechanism in the management of menstrual disorders. Result of this study confirmed that saffron can help relieve various symptoms of menstrual disorders, especially premenstrual syndrome. Saffron was beneficial to reduce stress or depression symptoms, it was also reducing pain more effectively than pain relievers and helped increase estrogen.

1 INTRODUCTION

Menstrual disorders are common problems which cause interfere with women's daily activity. Most teenagers and young adult women have experienced these problems (Laksham et al., 2019; Rahayu & Safitri, 2016). Its can occur in various symptoms, such as abnormal period, heavy bleeding, menstrual pain, and psychological problem. These symptoms can cause a secondary problem, such as heavy bleeding will lead to anemia. In comparison, menstrual pain and the psychological problem will decrease productivity. In the long term, menstrual disorders can decrease the function of the reproduction system.

Several factors have been found related to menstrual disorders. Some micronutrients, such as calcium, iron, thiamin, riboflavin, pyridoxine, and vitamin A have benefits to prevent menstrual disorders (Listiana et al., 2019; Rahayu & Safitri, 2016). Many studies used saffron as a treatment for menstrual disorders. It has been found that saffron reduced pain on women with dysmenorrhea (Azimi & Abrishami, 2016). Saffron also has benefits in the treatment of pre-menstrual syndrome (Agha-Hosseini et al., 2008). Saffron is also known to have an anti-inflammatory effect which can relieve menstrual pain. It can also reduce the psychological effect due

to menstrual disorders, such as mood swings, stress, or depression (Akhondzadeh et al., 2004).

This study used a literature review method. Literature identification was done using the keywords of "saffron" and "menstrual disorders" in PubMed, Google Scholar, and Europe PMC databases with open access. Articles were screened using inclusion criteria of 1) in Bahasa/English, 2) the outcome was symptoms of menstrual disorders. Studies which were used animal as subject, were excluded. This review is to provide comprehensive information about the benefits of saffron in the management of menstrual disorders.

2 CHEMICAL COMPOUNDS OF SAFFRON

Saffron is high antioxidant herbs from *Crocus sativus* plant. The mass of *Crocus sativus* flower mostly consists of tepals (78.4%). Other parts are stamens, stigmas, and styles, with 13.4%, 7.4%, and 0.7% of the mass, respectively (Moratalla-López et al., 2019). Most of saffron is produced in Iran, but it is also produced in India, Greece, Morocco, Spain, Italy, and Turkey. Commercial saffron is widely distributed as dried red stigma, which is usually served brewed as a tea. Saffron extract is also used as a dietary supplement.

Saffron contains macronutrients, fibers, minerals (iron, magnesium, manganese), vitamins (thiamin, riboflavin, pyridoxine, folate), and pigments (Siddiqui et al., 2018; Wani et al., 2011). Saffron nutritional value per 100 grams showed by Table 1. Pigments identified are anthocyanin, carotenoid, and zeaxanthin (José Bagur et al., 2017). It also contains beneficial bioactive compounds. The main bioactive compounds identified are safranal, crocin, and picrocrocin (Siddiqui et al., 2018). Crocin and picrocrocin content of saffron are the highest among other spices. Safranal is known to be responsible for odor and aroma, while crocin is responsible for the color, and picrocrocin for the bitter taste (Srivastava et al., 2010). Phenolics and flavonoids are also known to be present in saffron (Rahmani et al., 2017).

3 POSSIBLE MECHANISMS IN MENSTRUAL DISORDER TREATMENT

The menstrual disorder can variously present. The most common type of menstrual disorder is pre-

menstrual syndrome (PMS). Other manifestations are abnormal periods, dysmenorrhea, and heavy bleeding (Rafique & Al-Sheikh, 2018). Several studies, as shown in Table 2, have proven the benefits of Saffron administration to reduce menstrual disorders.

In present studies, saffron was effective in relieving pre-menstrual syndrome, dysmenorrhea, and menstrual pain (Agha-Hosseini et al., 2008; Fukui et al., 2011; Hausenblas et al., 2013). Saffron can also lighten abnormal bleeding (Nahid et al., 2009). Consuming saffron for 3-4 months can lower depression and pre-menstrual syndrome severity. A study conducted on women aged 20-45, who were randomly assigned to consume 30 mg saffron per day for two menstrual cycles, showed that it was effective to relieve symptoms of PMS. This is indicated by significant difference in the score of Total Daily Premenstrual Symptoms and Hamilton Depression Rating Scale (Agha-Hosseini et al., 2008).

Another study showed that consuming 500 mg of mixture of saffron stigma extract and several other herbs per day was showed a beneficial effect in relieving pain in women with dysmenorrhea. The effect is more significant from the effect of mafenamic acid (Nahid et al., 2009).

Table 1: Nutrition Value of 100 g Saffron.

	Nutrient Value	% of RDA
Energy	310 Kcal	15.5
Carbohydrates	65.37 g	50
Protein	11.43 g	21
Total Fat	5.85 g	29
Dietary Fiber	3.9 g	10
Folates	93 mcg	23
Pyridoxine	1.01 mg	77
Riboflavin	0.267 mg	20
Thiamin	0.115 mg	10
Iron	11.1 mg	139
Magnesium	264 mg	66
Manganese	28.408 mg	1235

Table 2. Studies of Saffron and Menstrual Disorder.

No	Author	Method	Subjects	Results
1	Agha-Hosseini, 2008	Randomized and double-blind clinical trial	47	Subjects, women aged 20-45, were randomly assign to consume 30mg saffron per day for two menstrual cycles. Saffron was found to be effective to relieve symptoms of PMS, indicated by significant difference in the score of Total Daily Premenstrual Symptoms and Hamilton Depression Rating Scale.
2	Fukui, 2011	Double blind	35	Aroma of saffron was relieving pre-menstrual syndrome, dysmenorrhea, and another menstrual disorder. Sniffing aroma of saffron for 20 minutes was decreasing cortisol and estrogen level.
3.	Nahid, 2009	Double blind RCT	180	Administration of 500 mg saffron, celery seed, and anise significantly reduced pain than mefenamic acid, and control group in the 2 nd and 3 rd period.
4.	Parastoo, 2018	Double blind RCT	180	Administration of 30 mg saffron extract significantly reduced pain than mefenamic acid, and control group in the 2 nd and 3 rd period.
5.	Beiranvand, 2015	Triple-Blind Controlled RCT	78	Saffron was significantly associated with lower pre-menstrual syndrome total score. But it has no association with appetite, sedation, headache, and euphoria.
6.	Ai, et al. 2009	Controlled trial	45	Wistar-albino as subjects is divided into 3 groups (15 each) and given orally normal saline, 20mg, dan 80mg/kg/day, respectively. After 30 days, serum levels of FSH, LH, progesterone, and estrogen were significantly increased.

Safranal is a compound that affects the odor and aroma of saffron. Safranal has anxiolytic properties, which is beneficial for the symptoms. Study conducted on 35 women showed that sniffing the aroma of saffron for 20 minutes can decrease cortisol and increase estrogen (Fukui et al., 2011). Estrogen works together with progesterone and prolactin to regulate the menstrual cycle. A study, using 45 female rats, showed that serum levels of progesterone and estrogen were significantly increased after administration of 80mg/kg/day for 30 days (Ai et al., 2009).

Saffron stigma contains thiamin, riboflavin, pyridoxine, and folate. These vitamins are related to the severity of the pre-menstrual syndrome and abnormal periods (Listiana et al., 2019; Rahayu & Safitri, 2016). Thiamin and riboflavin intake were inversely associated with the severity of pre-menstrual syndrome and the prevalence of abnormal periods. Thiamin and riboflavin are an essential component of energy metabolism. Thiamin was known for improving blood circulation and reduced skeletal muscle cramp. Thiamin was also significantly decreasing depression, stress, and anxiety. A controlled trial, conducted on dormitory students aged 18-30, showed that administration of 100 mg B1 supplement for three months would

lowering the mean of physical and mental symptom of Vitamin B1 group was significantly lower (Abdollahifard et al., 2014). These are involved in symptoms of pre-menstrual syndrome.

A meta-analysis study of 10 RCTs found that pyridoxine relieved overall pre-menstrual and depressive syndromes (Wyatt et al., 1999). Riboflavin is needed to activate pyridoxine, which is correlated to the level of the reproductive hormones. Low levels of pyridoxine increase levels of prolactin and result in higher severity of psychological symptoms due to menstruation. Pyridoxine is a cofactor in the synthesis of serotonin and dopamine. It is also involved in gamma-aminobutyric acid (GABA) synthesis and amino acid metabolism. Another meta-analysis also explained that pyridoxine deficiency may results to lower concentration of noradrenaline and serotonin (Soheila et al., 2016).

The folate level was inversely associated with homocysteine. Higher plasma homocysteine concentrations were associated with lower estradiol (a type of estrogen), higher follicle-stimulating hormone, and lower luteal phase progesterone. As these hormones regulate the menstrual cycle and fertility, an imbalance will lead to sporadic anovulation, which causes amenorrhea (Michels et al., 2017). Besides folate, riboflavin and pyridoxine

are also inversely related to homocysteine levels. Beneficially, these vitamins are contained in saffron.

Saffron has an inflammatory effect that comes from crocin, safranal, and anthocyanin content (Rahmani et al., 2017). Inflammation is one problem which associates with pre-menstrual syndrome. The inflammation biomarker (hs-CRP) level was elevated when pre-menstrual mood symptoms, abdominal cramps, bloating, and breast pain were occurring (Gold et al., 2016). Some studies suggest a beneficial effect of anti-inflammatory agent administration for treatment of menstrual disorder (Bofill Rodriguez et al., 2019; Gold et al., 2016).

Saffron main bioactive has known to have an antispasmodic effect. It prevents impulses from the parasympathetic nervous system from causing contractions, cramps, or spasms. Contraction and cramp are often experienced as menstrual pain occurs. Possible mechanisms explained including β 2-adrenoreceptors stimulation, histamine (H1) receptor inhibition, and calcium channel blocking (Mokhtari-zaer et al., 2015).

4 CONCLUSIONS

Saffron has a beneficial effect on the management of menstrual disorders. The benefit can be obtained through oral consumption or inhaling its aroma.

CONFLICT OF INTEREST

There is no conflict of interest.

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