Effect of Fortified Pan Bread with Safflower on Liver Cancer Incident by Benzopyrene in Rats

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Introduction

Nzo A [Pyrin] is an aromatic hydrocarbon that can be in a compound everywhere in Qatar. The substance with the formula C20H12 is one of the benzopyrene, formed from a benzene ring fused with pyrene [Kobayashi, (2017)]. Diol epoxide metabolites (known as BPDE) interact and are included in the first group of cancer by International Agency for Research on Cancer (IARC) in the eighteenth century [Jiao et al. (2012) and Kobayashi, (2017)]. It is linked that benzo [a] Pirin produced tumors (cancer) in experimental animals in several different ways (orally, through the skin, inhalation, intra-trachea, subcutaneous, intraperitoneal, for intravenous route). Benzo [a] Perrin had both a local and systemic carcinogenic effect (Joseph and Jaiswal, 1975; Rajendran et al., 2018).

The safflower plant (Carthamus tinctorius L), is a year old blooming herb, branched from the stellar family, and its native origin is the Middle East, but it is widely cultivated throughout Europe, China, India, and the United States, and is approximately one meter long and is It has shiny oval-shaped leaves, spruce edges that wrap around a smooth and flat stem, and produce flowers ranging in color from yellow to dark red (Daniel et al., 2012).

Much research indicates that safflower oil is used as a dietary supplement or as an alternative to other oils. Saffron contains nutrients including protein 16.18 g, fats 38.45 g, carbohydrates 34.29 g, monounsaturated fatty acids 4.84 g, multiple polyunsaturated fatty acids 28.22 g, calcium 78 mg, magnesium 353 mg, folate 160 micrograms, and many phenol compounds It is a derivative of serotonin. It also contributes to lowering the level of total cholesterol and low-density cholesterol. It was also found in the (Journal of Nutritional Science and Vitaminology, 1991) conducted in mice that consumed a high cholesterol regimen that phospholipids in saffron inhibited the high cholesterol in their blood and liver, and this effect depends on the level of these fats (Chilliard et al., 2015).

Saffron is contain in omega-6 reduces blood sugar levels. Reducing symptoms of Hepatitis C virus, lowering blood pressure in those with high levels, relieving constipation and relieving conditions of breathing problems, coughing, fever, and pain (Ramsden et al., 2018). Therefore,
the effect of fortification of pan bread with three levels of safflower powder on liver cancer induced by benzo [a] Pirin in albino rats were studied.

Material and Methods:

Materials:

- Benzo(a)pyrene ©: was acquired by Sigma Chemical Co. (St Louis, Mo, USA).

- Safflower (Carthamus tinctorius) flower, wheat flour (72 percent extract), wheat flour, sugar, and salt were purchased from the local market in Cairo as dried material. France-Egypt.

- Animals: Thirty six male albino rats, strain Sprague Dawley, weighing (150 ± 10 g) were bought from the Agricultural Research Centre's animal house in Giza, Egypt. The animals were kept in plastic cages, maintained on a natural light-dark cycle at room temperature of 26 ± 2°C, and fed on normal diet (Reeves et al., 1993).

- Methods:

  Pan bread making process: Pan bread was prepared according to Lazaridou et al. (2007). Preparation of pan bread was carried out by using wheat flour (72% extraction), blender replaced separately with 20%, 30% and 40% Safflower powder according to the method of AACC (2005).

  Proximate analysis: The proximate nutritional qualities of the bread samples was carried out according to the method of A.O.A.C (2000) which covers for total protein, ash, fat, dietary fiber and carbohydrates, respectively.

  Experimental design: Rats performed at the Food Technology Research Institute, Agriculture Research Centre, Giza, in the animal building. Five rats acted as a standard control group (-ve) after the acclimatization phase, while the other rats. Injected with one milliliter of a carcinogenic solution (10.08 mg/kg) containing benzo(a)pyrene s.c. In rats categorized in the previous study (Kallistratos and Fasske, 1976) into the positive control group (+ ve) and four treated rat groups, as the following:-

  BPCW: Group fed on basal diet with 20% pan bread (100%wheat flour).
**B_{PFS1}**: Group fed on basal diet with 20% pan bread fortified with 20% safflower powder.

**B_{PFS2}**: Group fed on basal diet with 20% pan bread fortified with 30% safflower powder.

**B_{PFS3}**: Group fed on basal diet with 20% pan bread fortified with 40% safflower powder.

The second biological assessment of the diets evaluated at the end of the 6-week experiment was conducted by assessing total feed consumption, body weight gain (BWG) and the Feed efficiency ratio (FER).

**Biochemical analysis:**

**Determination of liver enzymes:** The activity of serum alanine and aspartate aminotransferases (ALT & AST) and alkaline phosphatase (ALP) enzymes was determined according to (Reitman and Frankel, 1957).

Determination of serum lipids: The method of assaying the total lipids (Kaplan, 1984). Serum total cholesterol (TC) was according to (Henry, et al., 1974). The Serum triglycerides (TG) were determined according to Fossati and Prencie (1982). Method Serum high density lipoprotein cholesterol (HDL-cholesterol) was according to Burstein, (1970). The low density lipoprotein cholesterol (LDL-cholesterol) concentration in serum was estimated by the equation as follows: LDL-cholesterol (mg/dl) = Total cholesterol — HDL cholesterol — (TG/5)

**Determination of kidney functions:**

Measurement of serum urea and creatinine were done according to the method of Patton and Crouch, (1977).

**Determination of serum antioxidant parameters:**

Operation of superoxide dismutase(SOD), complete potential of antioxidants (TAC), malondialdehyde (MDA), and tumor necrosis factor (TNF-α) were determined according to Nishikimi et al. (1972), Cao et al. (1996), Ohkawa et al. (1979) and Thorell and Lanner, (1973), respectively.
Statistical analysis:

The collected data were analyzed using computerized statistics (SPSS). Effects of various treatments were analyzed using the one-way ANOVA (Variance Analysis) method using the multi-range method of Duncan, and p<0.05 was used to suggest significance between different groups (SAS 1988).

Results and Discussion:

Proximate analysis constituent of safflower flowers:

Table (1) showed that, moisture content increased gradually by increasing level of safflower powder in bread. Results showed a significant increase (p<0.05) Ash and dietary fiber content in pan bread which Fortified with safflower increased, than that of un-fortified pan bread (control) (BPCW).

Both ash and dietary fiber tendency to increase according to the increments of safflower powder in pan bread fortified due to the higher content of safflower powder in ash and dietary fiber compared to wheat flour.

Table 1: Chemical composition of control and fortified pan bread with safflower powder

<table>
<thead>
<tr>
<th>Parameters</th>
<th>BPCW</th>
<th>BPF1</th>
<th>BPF2</th>
<th>BPF3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>32.70</td>
<td>35.16</td>
<td>36.90</td>
<td>39.10</td>
</tr>
<tr>
<td>Protein</td>
<td>10.95</td>
<td>10.20</td>
<td>10.97</td>
<td>12.50</td>
</tr>
<tr>
<td>Fat</td>
<td>4.67</td>
<td>4.14</td>
<td>3.91</td>
<td>2.13</td>
</tr>
<tr>
<td>Ash</td>
<td>1.34</td>
<td>2.41</td>
<td>2.47</td>
<td>3.61</td>
</tr>
<tr>
<td>Dietary fiber</td>
<td>1.54</td>
<td>3.83</td>
<td>5.01</td>
<td>6.82</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>48.84</td>
<td>44.26</td>
<td>40.75</td>
<td>36.85</td>
</tr>
</tbody>
</table>

Nutritional characters of control and fortified pan bread with safflower powder

Table (2) indicates a steady decrease in body weight gain, feed intake and FER In the positive control group (+ve) by about, 67.10%, 23.70% and + 2.722 relative to normal control group (-ve). Statistical data showed that control (+ ve) rat group showed a substantial decrease in body weight gain, feed intake and feed efficiency ratio, whereas All treatments with pan bread Which fortified with safflower powder showed significant increases in these parameters compared to control (+ ve) group at three levels, and no significant difference compared to control (-ve) group.

Table (2): Effect of safflower powder on feed intake, body weight and Feed efficiency ratio in rats received benzo(a)pyrene
<table>
<thead>
<tr>
<th>Groups</th>
<th>Weight gain (g)</th>
<th>%</th>
<th>Feed intake (g/d)</th>
<th>%</th>
<th>FER</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contr. (-ve)</td>
<td>96.76± 8.11 a</td>
<td>-</td>
<td>17.54± 2.20 a</td>
<td>-</td>
<td>0.187± 0.03a</td>
<td>-</td>
</tr>
<tr>
<td>Contr. (+ve)</td>
<td>29.64± 8.11d</td>
<td>-67.10</td>
<td>13.34± 2.20d</td>
<td>-23.70</td>
<td>0.67± 0.06e</td>
<td>+ 2.722</td>
</tr>
<tr>
<td>BPCW</td>
<td>86.13± 9.13 c</td>
<td>- 13.80</td>
<td>16.46± 2.32 a</td>
<td>- 7.13</td>
<td>0.185± 0.04ab</td>
<td>- 1.07</td>
</tr>
<tr>
<td>BPFSS1</td>
<td>87.27± 9.17 c</td>
<td>- 10.11</td>
<td>16.35± 2.21 a</td>
<td>- 7.19</td>
<td>0.183± 0.03b</td>
<td>- 2.14</td>
</tr>
<tr>
<td>BPFSS2</td>
<td>88.04± 9.17 b</td>
<td>- 9.44</td>
<td>16.08± 2.92 a</td>
<td>- 7.02</td>
<td>0.185± 0.04 ab</td>
<td>- 1.07</td>
</tr>
<tr>
<td>BPFSS3</td>
<td>93.44± 9.17 b</td>
<td>- 6.40</td>
<td>16.66± 2.32 a</td>
<td>- 7.13</td>
<td>0.180± 0.04 c</td>
<td>- 3.74</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD, n=6, mean values are different at p<0.05 in each column with different superscripts (a, ,b, c, ..) and vice versa.

BPCW: pan bread of 100% wheat flour, BPFSS1: pan bread fortified with 20% safflower powder, BPFSS2: pan bread fortified with 30% safflower powder. BPFSS3: pan bread fortified with 40% safflower powder.

**Effect of pan bread fortified with safflower powder on lipid profile in rats received benzo(a)pyrene**

The effects of fortified pan bread with safflower powder at three levels (20, 30 & 40%) on serum lipid profile for benzo(a)pyrene injection induced cancer liver are shown in Table (3). Cancer liver induced by benzo(a)pyrene injection caused significant rise in total lipids, triglycerides, total cholesterol and LDL-C while, there was significant decrease in HDL-C.

Treatment with fortified pan bread with safflower powder at three different dose levels induced significant decreasing in serum total lipids, triglycerides and total cholesterol at three levels administration while The best result of lipid profile was at the high level 40%. In this respect, benzo(a)pyrene, an antibiotic with broad spectrum of effect against many clinically important bacteria, possess inherent cancer liver effects and induces micro vesicular steatosis by increasing the of accumulation triglyceride, inhibiting β-oxidation of free fatty acids, secretion of lipoprotein from the liver and mitochondrial lipid metabolism (Helal, et al., 2012). Safflower is to be effective in ameliorating the undue effects of the useful antibiotic. As an antioxidant safflower, contributes to liver and pancreatic health by helping the body to more quickly remove toxins.
It has also being linked to lowered or normalized cholesterol levels (Daniel, et al., 2019).

Effect of pan bread fortified with safflower powder on liver function in rats received benzo(a)pyrene

With regard to liver function, LT4 led to a remarkable increase in serum AST, ALP and ALP levels in positive control (+ve) group as comparing with (-ve) group. Feeding rats on fortified pan bread with safflower powder with different premixes decreased activities of AST, ALP and ALK levels of cancer liver rats near to the level of the control (-ve). Though, the significant elevation witnessed in AST, ALP and ALK levels of cancer liver rats (Table 4). The best result was 40 per cent high, followed by 30%. According to our findings, (Helal, et al., 2012) documented cancer liver oxidative damage and increased levels of AST, ALT, ALP, total bilirubin and reduced total protein. Also, caused histopathological alterations. Therefore, the reduction in serum levels of AST, ALT, and ALP by safflower powder treatment is an indication of stabilization of plasma membrane as well as repair of hepatic tissue damage caused by benzo(a)pyrene injection. This result shows that, with cancer liver recovery, the serum transaminase levels return to normal (Chilliard et al., 2015).

Effect of pan bread fortified with safflower powder on kidney function in rats received benzo(a)pyrene

Table (5) Results showed kidneys function tests were elevated by benzo(a)pyrene injection in (+ve) control group. Whereas uric acid, urea and creatinine levels were found to be significantly lowered by fortified pan bread with safflower powder treatment at three different dose levels. The best result was at high levels 40% followed by 30%. Also, Astragalin effect may prevent the progression of chronic renal disease and had anti-inflammatory activity which reduced infiltration of inflammatory cells (Ansari et al., 2012 and Ni et al., 1919).

Effect of pan bread fortified with safflower powder on SOD, Total antioxidants, MDA and TNF-α in rats received benzo(a)pyrene

The effects of safflower powder at two levels on serum antioxidant parameters in benzo(a)pyrene injection induced cancer liver are shown in Table (6). Benzo(a)pyrene injected cancer liver induced a substantial decrease in serum superoxide dismutase SOD, total antioxidant levels
MDA, and TNF-α. Significant increasing was noticed by fortified pan bread with safflower powder treatment at high level 40% followed by 3% level.

On the other hand, significant increasing was noticed in malondialdehyde MDA and tumor necrosis factor TNF-α of (+ve) control group. Treatment with fortified pan bread with safflower powder at three levels significantly attenuated the increased levels of MDA and TNF-α. The higher level 40% had the better result than 30% level. Also, several reports have shown the hepatoprotective effect of vitamin C against the cancer liver caused by some drugs (Kobayashi, 2017). Hence, vitamin C can function as an antioxidant by scavenging ROS, reducing oxidative stress and associated complications. In addition, vitamin C as a safflower powder improves vitamin E's antioxidant capacities, indicating that the main role of vitamin C is to recycle tocopheroxyl radicals and glutathione, and to prevent lipid peroxidation and hepatocellular harm (Ramsden et al., 2018).

Data are expressed as mean, n = 3. \( B_{PCW} \): pan bread of 100% wheat flour, \( B_{PFS1} \): pan bread fortified with 20% safflower powder, \( B_{PFS2} \): pan bread fortified with 30% safflower powder. \( B_{PFS3} \): pan bread fortified with 40% safflower powder.

**Table (3): Effect of pan bread fortified with safflower powder on lipid profile in rats received benzo(a) pyrene**

<table>
<thead>
<tr>
<th>Groups</th>
<th>TC mg/dl</th>
<th>%</th>
<th>TG mg/dl</th>
<th>%</th>
<th>LDL-c mg/dl</th>
<th>%</th>
<th>HDL-c mg/dl</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (-ve)</td>
<td>75.49±3.86</td>
<td>-</td>
<td>45.16±3.28</td>
<td>-</td>
<td>38.30±5.25</td>
<td>-</td>
<td>28.35±4.71</td>
<td>-</td>
</tr>
<tr>
<td>Control (+ve)</td>
<td>121.46±3.84</td>
<td>+60.89</td>
<td>75.43±8.15</td>
<td>+67.03</td>
<td>86.31±8.83</td>
<td>+125.35</td>
<td>19.47±1.18</td>
<td>-31.32</td>
</tr>
<tr>
<td>( B_{PCW} )</td>
<td>81.27±5.52</td>
<td>+7.65</td>
<td>51.19±6.46</td>
<td>+13.35</td>
<td>46.98±5.75</td>
<td>+22.66</td>
<td>24.03±0.37</td>
<td>-15.24</td>
</tr>
<tr>
<td>( B_{PFS1} )</td>
<td>80.14±3.65</td>
<td>+6.16</td>
<td>49.18±5.79</td>
<td>+8.90</td>
<td>42.65±1.74</td>
<td>+11.36</td>
<td>27.71±2.36</td>
<td>-2.26</td>
</tr>
<tr>
<td>( B_{PFS2} )</td>
<td>77.46±4.65</td>
<td>+2.61</td>
<td>47.76±4.75</td>
<td>+5.76</td>
<td>40.97±4.74</td>
<td>+6.97</td>
<td>26.92±3.36</td>
<td>-5.04</td>
</tr>
<tr>
<td>( B_{PFS3} )</td>
<td>77.11±3.66</td>
<td>+2.14</td>
<td>47.19±4.75</td>
<td>+4.49</td>
<td>40.72±4.74</td>
<td>+6.32</td>
<td>26.96±2.36</td>
<td>-4.90</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD, n=6, mean values are different at p<0.05 in each column with different superscripts (a, b, c, ..) and vice versa. \( B_{PCW} \): pan bread of 100% wheat flour, \( B_{PFS1} \): pan bread fortified with 20% safflower powder, \( B_{PFS2} \): pan bread fortified with 30% safflower powder, \( B_{PFS3} \): pan bread fortified with 40% safflower powder.
Table (4): Effect of pan bread fortified with safflower powder on liver function in rats received benzo(a)pyrene

<table>
<thead>
<tr>
<th>Groups</th>
<th>AST (U/L)</th>
<th>%</th>
<th>ALT (U/L)</th>
<th>%</th>
<th>Alk (µ/ml)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (-ve)</td>
<td>43.82± 2.11 d</td>
<td>-</td>
<td>22.51± 1.78</td>
<td>-</td>
<td>40.71± 5.02 b</td>
<td>-</td>
</tr>
<tr>
<td>Control (+ve)</td>
<td>84.07± 5.58 a</td>
<td>+ 91.85</td>
<td>46.36± 3.27 a</td>
<td>+105.95</td>
<td>60.78± 7.01 a</td>
<td>+94.30</td>
</tr>
<tr>
<td>BPCW</td>
<td>42.86± 2.75 d</td>
<td>- 2.19</td>
<td>22.46± 2.13 d</td>
<td>- 0.22</td>
<td>48.75± 4.81 b</td>
<td>- 0.99</td>
</tr>
<tr>
<td>BPF1</td>
<td>50.08± 4.28 b</td>
<td>+ 14.28</td>
<td>27.99± 3.43 b</td>
<td>+ 24.34</td>
<td>45.91± 4.31 b</td>
<td>0.43</td>
</tr>
<tr>
<td>BPF2</td>
<td>46.82± 3.02 c</td>
<td>+ 6.84</td>
<td>26.73± 2.14 b</td>
<td>+ 18.75</td>
<td>43.41± 4.31 b</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD, n=6, mean values are different at p<0.05 in each column with different superscripts (a, b, c, ..) and vice versa. BPCW: pan bread of 100% wheat flour, BPF1: pan bread fortified with 20% safflower powder, BPF2: pan bread fortified with 30% safflower powder. BPF3: pan bread fortified with 40% safflower powder. Alk: Alkaline phosphatase

Table (5): Effect of pan bread fortified with safflower powder on kidney function in rats received benzo(a)pyrene

<table>
<thead>
<tr>
<th>Groups</th>
<th>Uric acid mg/dl</th>
<th>%</th>
<th>Urea mg/dl</th>
<th>%</th>
<th>Creatinine mg/dl</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (-ve)</td>
<td>2.73± 0.78 b</td>
<td>-</td>
<td>42.67± 3.06 c</td>
<td>-</td>
<td>1.02± 0.07 b</td>
<td>-</td>
</tr>
<tr>
<td>Control (+ve)</td>
<td>5.20± 0.52 a</td>
<td>+ 125.83</td>
<td>70.03± 2.65 a</td>
<td>+ 70.40</td>
<td>1.97± 0.31 a</td>
<td>- 43.54</td>
</tr>
<tr>
<td>BPCW</td>
<td>4.92± 0.57 a</td>
<td>+ 9.93</td>
<td>65.0± 7.64 ab</td>
<td>- 1.47</td>
<td>1.37± 0.15 b</td>
<td>- 0.99</td>
</tr>
<tr>
<td>BPF1</td>
<td>2.92± 0.72 b</td>
<td>+ 97.35</td>
<td>61.67± 6.35 ab</td>
<td>+ 9.63</td>
<td>1.41± 0.22 b</td>
<td>- 27.43</td>
</tr>
<tr>
<td>BPF2</td>
<td>2.80± 0.93 b</td>
<td>+ 44.88</td>
<td>56.01± 3.21 bc</td>
<td>+ 7.08</td>
<td>1.17± 0.06 b</td>
<td>- 11.13</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD, n=6, Mean values in each column having different superscript (a, b, c,..) are significant at p<0.05 by different and vice versa. BPCW: pan bread of 100% wheat flour, BPF1: pan...
bread fortified with 20% safflower powder, B_{PFS2}: pan bread fortified with 30% safflower powder. B_{PFS3} : pan bread fortified with 40% safflower powder.

Table (5): Effect of pan bread fortified with safflower powder on SOD, Total antioxidants, MDA and TNF-α in rats received benzo(a)pyrene

<table>
<thead>
<tr>
<th>Groups</th>
<th>SOD u/ml</th>
<th>%</th>
<th>Total antioxidants mmol/L</th>
<th>%</th>
<th>MDA mmol/L</th>
<th>%</th>
<th>TNF-α (pg/ml)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (-ve)</td>
<td>2.73±0.78</td>
<td></td>
<td>42.67±3.06 d</td>
<td></td>
<td>1.02±0.07 c</td>
<td></td>
<td>3.08±0.29 d</td>
<td></td>
</tr>
<tr>
<td>Control (+ve)</td>
<td>5.20±0.52</td>
<td>+</td>
<td>70.03±2.65 a</td>
<td>+</td>
<td>7.97±0.31 a</td>
<td>90.74</td>
<td>9.99±1.04 a</td>
<td>22.48</td>
</tr>
<tr>
<td>B_{PCW}</td>
<td>4.92±0.57</td>
<td>+</td>
<td>65.0±7.64 a</td>
<td>-1.47</td>
<td>4.37±0.15 b</td>
<td>8.17</td>
<td>7.63±0.52 b</td>
<td>-7.54</td>
</tr>
<tr>
<td>B_{PFS1}</td>
<td>2.92±0.72</td>
<td>+</td>
<td>61.67±6.35 ab</td>
<td>+9.63</td>
<td>3.41±0.22 b</td>
<td>9.43</td>
<td>5.11±0.08 b</td>
<td>-4.90</td>
</tr>
<tr>
<td>B_{PFS2}</td>
<td>2.80±0.93</td>
<td>+</td>
<td>56.01±3.21 c</td>
<td>+7.08</td>
<td>2.17±0.06 b</td>
<td>10.38</td>
<td>4.56±0.08 c</td>
<td>-5.45</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD, n=6, mean values are different at p<0.05 in each column with different superscripts (a, b, c, ..) and vice versa. B_{PCW}: pan bread of 100% wheat flour, B_{PFS1}: pan bread fortified with 20% safflower powder, B_{PFS2}: pan bread fortified with 30% safflower powder. B_{PFS3}: : pan bread fortified with 40% safflower powder.

Abstract:

The current investigation was carried out to examine the possible potential protective effects of safflower against benzo [a] pirin-induced cancer liver. This study was conducted on thirty six male albino the rats divided into two main groups; the first main groups group (n= 6 rats) was fed on the basal diet And used as anegative control (–ve) normal rats. The rats of the second main group (n= 30 rats) fed basal diet and injected benzo[a] Pirin (10.08 mg/kg) in the previous cancer liver induction study and then divided into four subgroups (n=6 rats) as follows: group (2) fed basal diet without any treatment and used as a positive control (C+ve)Groups (3,4,5&6) fed on basal diet containing 20% pan bread fortified B_{PCW}, B_{PFS1}, B_{PFS2}, B_{PFS3} & B_{PFS4} for 28 days. Results indicated that, injected benzo [a] pirin cancer liver groups showed high significant increase in serum AST, ALT, ALP, total lipids, total cholesterol, triglycerides, LDL cholesterol, urea, creatinine, MDA and tumor
necrosis factor TNF,α. While body weight gain, feed intake, feed efficiency ratio, total protein, HDL, SOD and total antioxidants were significantly decreased compared to control positive group. Treatment with pan bread fortified with safflower powder attenuated these adverse effects and ameliorated the evaluated biochemical parameters. The best result was pan bread for B\textsubscript{PFS} at high level 40% , 30% followed by 20% fortified with safflower powder diets compared to pan bread with 100% B\textsubscript{PCW}. In conclusion, the results demonstrate that safflower has a potent protective effect against benzo [a] pirin -induced cancer liver injury in rats. The results also revealed that the effect of pan bread with safflower powder on the liver cancer may be attributed to its antioxidant and free radical scavenger.

**Key words:** bread with- Cancer- safflower- wheat flour

**References:**


تأثر الخبز المدعم بعشبة العصفر على سرطان الكبد الناتج عن البنزوبيرين في الفئران

المختصر العربي

أجريت الدراسة الحالية للتفتيح على التأثير الوقائي لعشبة العصفر ضد سرطان الكبد الناجم عن الإصابة بمادة البنزوبيرين.  أجريت هذه الدراسة على ستة و ثلاثون من ذكور الفئران البيضاء وقسمت إلى مجموعتين رئيسيتين، المجموعة الرئيسية الأولى (10 فأر) تغذت على الوجبة القياسية ووزلت كمجموعة ضابطة سلبية، أما المجموعة الرئيسية الثانية (10 فأر) تغذت على الوجبة القياسية مع الحقن بمادة البنزوبيرين (800 ملم/كم) لأحداث سرطان الكبد ثم قسمت إلى أربع مجموعات فرعية (1 فأر) على النحو التالي: المجموعة (1) تغذت على الوجبة القياسية ووزلت كمجموعة ضابطة موجبة، و (0.5، 1، 4 و 0.5، 1، 4) والتي تغذت على الوجبة القياسية بالإضافة إلى الغذاء允许 على 20٪ من الخبز القابل المدعم بعسب العصفر بنسب مختلفة 30، 20 و 10٪ لمدة 17 يوم. أظهرت النتائج أن المجموعات المصابة بالسرطان الكبد الناجم عن الإصابة بالمادة البنزوبيرين زيادة معنوية عالية في سيريم ALP، ALT، AST، الدهون الكلية، الكولسترول الكلي، الدهون الثلاثي، الديهون، الكرياتينين، الببتيدات، الأكسدة الكلية، MDA، NF-κB في حين زاد وزن الجسم وتناول المأخوذ من الوجبة، ونسبه كلفائحة الغذاء، البروتينات تصل إلى 20٪، وتقلل من مضادات الأكسدة الكلية بشكل ملحوظ مقارنة بالمجموعة الدخليز الموجبة. بينما المجموعات التي عوضت بالخبز المدعوم بالعصر خفضت من الآثار السلبية وادت إلى تحسن في المعايير الكيميائية، وكانت أفضل النتائج التي تناولت الخبز القابل المدعم بعسب العصفر عند مستوي عالي من التركيز (0٪ ثم يليه 30٪، 40٪، 50٪) ثم يليه الخبز الدخليز الغير مدعم 100٪ بدقة القمح. وفي النهاية، أظهرت النتائج أن عب العصفر لها تأثير وقائي قوي ضد الإصابة بسرطان الكبد الناجم عن مادة البنزوبيرين. كما أوضحت النتائج أن تأثير الخبز القابل المدعم بعسب العصفر على سرطان الكبد يمكن أن يرجع إلى ارتفاعه في مضادات الأكسدك وهكاك أيضا للشفقة الحرة في الجسم.