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## REVIEW ARTICLE

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### A REVIEW OF HAEMATOLOGICAL, BIOCHEMICAL, AND HISTOPATHOLOGICAL EFFECTS OF PHOENIX DACTYLIFEROUS

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#### Abstract

Before the development of modern medicine, people relied on medicinal plants to treat and manage illnesses. For a huge portion of people, mainly in the poor countries, medicinal herbs continue to offer excellent health protection. Date palm is a delicious, powerfully nutritious, aphrodisiac, tonic, and laxative fruit enjoyed by all since ancient times dates are seen to be an ideal food and part of a balanced diet because of the vital nutritional information included in them. Dates are not only able to increase haemoglobin levels, but also increase other haematological parameters, such as: ferritin levels, haematocrit, serum iron and transferrin saturation.

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#### Introduction:-

Before the development of modern medicine, people relied on medicinal plants to treat and manage illnesses. For a huge portion of people, mainly in the poor countries, medicinal herbs continue to offer excellent health protection [1]. About 80% of the human population is thought to still rely on these natural therapies today [2] and therefore, the therapeutic benefits of this medicinal plants continue to be utilized in both traditional and modern medicine [3].

Date palm is a delicious, powerfully nutritious, aphrodisiac, tonic, and laxative fruit enjoyed by all since ancient times dates are seen to be an ideal food and part of a balanced diet because of the vital nutritional information included in them. It has attained valuable status in many formulations according to medical systems including Ayurveda, Siddha, and Unani medicines. It is recommended in Ayurveda that dates be consumed every day [4]. Date is made up of 15 distinct mineral salts and vitamins, as well as 40 – 80% of carbohydrates, 6.0 – 11.0% of dietary fiber, 2.5 - 5.0% of protein, and 0.2 - 0.5% fat [5].

Phoenix dactyliferous L. is one of the species of date palm which is said to cultivate copiously in countries around the Arabian Gulf belonging to family Arecaceae and the plant is also considered as one of the oldest cultivated fruit trees in the Middle East since 6000 BC. Due to its abundance and historical traditional applications, and has been described as “tree of life” among the Arabian nations. It has more than a few names in different areas around the world. Many conditions are treated using various date palm parts, including memory problems, fever, inflammation, paralysis, loss of consciousness, nerve diseases, and oxidative stress [2].

Dietary fibers of Phoenix dactylifera have significant therapeutic benefits and act as a preventative measure for diseases like diabetes, obesity, hyperlipidemia, hypertension, and coronary heart disease. Additionally, it has the potential to be antibacterial, antifungal, antiviral, hepato-protective, anti-inflammatory, and anti-proliferative [3]. Phoenix dactylifera is a powerful antioxidant which is rich in flavonoids, potassium, low calcium levels and phenolics. Due to the fact that date palm has a high content of magnesium, it is expected to exert antagonistic effects on the adverse effects of opioids. The use of opioids has always been correlated to brain oxidative damage, kidney and liver, and several studies have indicated that usage of opioids such as morphine for a long period of time leads to decreased levels of antioxidant enzymes and antioxidants [6].

Anaemia is the most common blood disorder with a deficient number of RBCs to meet physiological needs of the body due to the deficiency of iron generally. Though there are various causes of anaemia that include vitamin B12, folate malnutrition, vitamin deficiencies, congenital or acquired abnormalities and chronic inflammation which interfere with haemoglobin synthesis and RBCs production and their survival. RBCs transfer iron rich proteins (haemoglobin) which attach to oxygen within the lungs and conveyed to tissues all over the body. Anaemia mostly appears whenever an individual does not have adequate red blood cells to function properly and it affects more than 3 million Americans [2].

Phenyl hydrazine (PHZ) induces haemolysis of red blood cells by prompting the synthesis of lethal and unstable molecule which is made during normal cell metabolism (free radicals) accelerating aging processes of RBCs leading to immature splenic sequestration which can bombard macromolecules of the cells for example haemoglobin which results into red blood cells oxidative damage leading to their demolition. Hypoxia of tissues can be due to a quantitative deficiency of circulating red blood cells and thus there is inadequate haemoglobin to bring the number of red blood cells and haemoglobin concentration back to the original levels that can be observed in the rats which are not subjected to PHZ-anaemia induction. Erythropoietin-manufacturing cells in the kidney stimulates tissue hypoxia which will in turn manufacture erythropoietin hormone to a certain level of differentiation and proliferation of hematopoietic progenitor cells within the bone marrow of all the anaemic rats which resulted in the emendation of anaemia providing that the response to the impairing of the bone marrow by deficiency of nutrients for red blood cell as occurring in iron deficiency anaemia [3].

### **Haematological effects**

Anaemia subsists as a fundamental risk factor for patients with compensated as well as decompensated cirrhosis, which increase the odds of hepatic decompensation and its mortality. In spite the fact that, anaemia is caused by the iron deficiency anaemia (IDA) primarily with prevalent data and its impact still limited among patients with cirrhosis and IDA [7] appears with early-stage disease onset in those with compensated cirrhosis. Anaemia is repeatedly underrated in cirrhosis, yet beyond half of the patients with cirrhosis have anaemia [8].

Dates are not only able to increase haemoglobin levels, but also increase other haematological parameters, such as: ferritin levels, haematocrit, serum iron and transferrin saturation. However, other studies have stated that there is no increase in ferritin levels after consuming dates [9]. Preliminary study results in March 2017 conducted on adolescent girls with anaemia showed a substantial variation in haemoglobin levels before and after the iron supplements and date palms were given to adolescent girls who had anaemia with the mean before intervention 9.9 g / dl and mean after of 11.2 g / dl and had a significant difference in haemoglobin levels before and after iron supplementation in adolescent girls with anaemia with mean before treatment (10.0 g / dL) and mean after treatment (10.9 g / dL) with no substantial difference in haemoglobin levels after treatment between the intervention groups as the first group was given dates on iron (Fe) supplements and the control group only took Fe supplements among adolescent girls with anaemia [10]. Flavonoids out of possession of jujube dates are linked to provoke the erythropoietin (EPO) by expressing a hormone stimulating blood yielding in production and deliberated that flavonoid strength as its active compounds that possess the capability to actuate the expression of EPO [9, 11-18].

Report show that iron and vitamin minerals contain numerous freshness of 0.48 milligrams of iron and 69 milligrams of vitamin C per 100 grams of fresh fruit and just like that, the daily intake of dates possibly will increase our dietary iron and vitamin so as to prevent anemia due to deficiency of iron or vitamin C [6].

Erythropoiesis is weighed to frisk the carping hematopoietic roles in which making of red blood cells (RBCs) is transpired and it is in this process where a red blood cell specific hormone (EPO), is capable of regulating erythropoiesis within the bone marrow. Entrenched on the aforementioned experimental results, the gainful role of

jujube dates in treating anaemia and other blood deficiencies may well therefore be closely related to the EPO-mediated erythropoiesis and loaffer to up regulate the circulating EPO subjected to hypoxia thereafter leads to anemia [8].

### **Biochemical effects**

#### **Liver enzymes**

Some of the important liver enzymes are transaminases which are vital in the quantification of different concentrations and manufacturing of numerous amino acids. It is important in tracing and diagnosing a lot of diseases. Pyridoxal-phosphate co-enzyme is required which is converted to pyridoxamine in the first phase of the reaction, as soon as an amino acid is converted into a keto acid, and the pyridoxamine enzyme is bound which in turn reacts with oxaloacetate, pyruvate, or alpha-ketoglutarate, giving alanine, aspartic acid, and glutamic acid [18].

#### **Alanine transaminase (ALT)**

Even though serum AST and ALT become elevated every time disease processes affect liver cell integrity, ALT is the more liver-specific enzyme. Additionally, elevations of ALT activity persist longer than elevations of AST activity. Vitamin B6 deficiency will find decreased aminotransferase activity in patient's serum with aminotransferase and pyridoxal phosphate which are reduced and the prosthetic group for aminotransferases which will result in an increased ratio of Apo enzyme to halo enzyme. The presence of pyridoxal phosphate in this test can cause a rise in activity of aminotransferase and its instigation is higher for AST than for ALT. Pyridoxal phosphate instigation prevents falsely low aminotransferase activity in patient samples with insufficient endogenous pyridoxal phosphate or vitamin B6 deficiency [19].

#### **Aspartate transaminase (AST)**

Aspartate aminotransferase enzyme is broadly circulated in tissues, mainly cardiac, hepatic, kidney, and muscle. Higher serum levels are usually found in diseases comprising these tissues. Cirrhosis, viral hepatitis, and metastatic carcinoma are hepatobiliary diseases which can also cause increased serum AST levels. Following myocardial infarction, serum AST is elevated and reaching a peak within two days after onset. In certain instances, patients undergo renal dialysis and those who have vitamin B6 deficiency, their serum AST might be reduced. The outward reduction in AST might be due to reduced pyridoxal phosphate, the prosthetic group for AST which result in an increased ratio of Apo enzyme to halo enzyme [20].

#### **Lipid profile**

Cholesterol, triglycerides, phospholipids frisky pivotal roles in metabolic pathways which are transported in the blood as lipoproteins which includes Low Density Lipoprotein (LDL), Very Low-Density Lipoprotein (VLDL) and High-Density Lipoprotein (HDL). Homeostatic disruption of these lipoprotein and lipids resulting in dyslipidemia which has special effects on our health, consequently greater devotion is paid to abnormal levels of lipids and factors associated to it [21].

Lipid profiles results in wistar rats induce-anaemia with PHZ knowingly greater than before plasma cholesterol and down-regulate triglyceride and phospholipid. However, the levels of triglyceride, hepatic cholesterol, and phospholipid are significantly lesser in the anaemia-induced group compared to control group [22-23].

Lipoprotein and lipid aberrations have presented to be the analysts for some disturbances in metabolic process, such as hypertension, dyslipidemia, diabetes, liver dysfunction, and heart disease. Homeostasis due to abnormal lipids is described in haematological disorders such for example sickle cell anaemia which alter function of red blood cell and membrane fluidity [24].

#### **Creatinine**

Creatinine is a waste product that is produced due to wear and tear of muscles of the body. Kidney function is mainly measure in clinical setting by estimating the concentration of serum creatinine which is an endogenous filtration marker from the blood [25].

### **Histopathological Effects on Organs**

#### **Liver**

A liver is a chief site of detoxification, metabolism of drugs, and xenobiotic in the human body [26]. Drug addiction leads to liver diseases, accounting for over half of all cases of acute liver failure [27]. Date palm powder of Phoenix

dactylifera L. seeds is used by several countries which produce it to treat various diseases in Folk medicine including gastrointestinal disorders, liver disorders, diabetes, throat diseases, diarrhoea, cancer, toothaches, and pulmonary and numerous other infections [28]. Moroccan herbal medicine like date palm seeds are used as a tool to treat jaundice and as a liver detoxifier [29].

### **Spleen**

A spleen is an organ located in the left upper quadrant part of the abdomen which plays a role in the development of blood cells and helps to remove old blood cells from the bloodstream. It can also play a harmful role in causing certain kinds of anaemia by destroying red blood cells improperly. It may also inappropriately be destroying platelets, causing thrombocytopenia (a low platelet count) which is associated with abnormal bleeding manifested by easy bruising, vaginal bleeding, rectal bleeding, internal bleeding, and red spots on the skin (petechiae). Symptoms of anaemia may include paleness, weakness, enlarged spleen, and shortness of breath. Surgical removal of the spleen may lead to marked improvement in anaemia and thrombocytopenia in certain patients [30].

Patients with iron deficiency anaemia (IDA) had splenomegaly specifically with incidence of 12% among patients with severe anemia and equate to 50% among patients with extremely severe anaemia. It was therefore concluded to have been causing extramedullary haematopoiesis. The hypothesis has therefore recent studies confirmed that the bone marrow-derived hematopoietic stem cells (HSCs) originate in the sinuses near endothelial cells and the spleen. Embryonic cells and related structural function are seen during the development of extramedullary haematopoiesis within the spleen [31].

### **Kidney**

Kidney failure is usually associated with reduced erythropoietin production leading to hypo-proliferative anaemia and this is because, the kidney is the organ primarily responsible for the regulation of red blood cell production (erythropoiesis) [32]. The kidney secretes hormone called erythropoietin which is very different from many blood production growth factors and this is because, it is produced mainly from the kidney other than the bone marrow. The kidney has the ability to noticed oxygen tension and extracellular volume. The kidney was also designed with the capacity to translate a measure of plasma volume as tissue oxygen required to regulate erythropoietin production.

Kidney is a very important organ in the body and has a wide range of physiological function and most importantly, the regulation of erythropoiesis [33]. In spite of this, the plasma filtration is the main function in which the kidney is known for. The separation of the glomerular filtrate from the blood is the result of ultrafiltration of water and its solute therefore, any renal failure is always associated with a decreased erythropoietin release which usually result to hypo-proliferative anaemia. Generally, patients with end stage renal failure develop anaemia which is as a result of lower secretion of erythropoietin by the kidney. Although, this is not the case in patients with autosomal dominant polycystic kidney disease (ADPKD) which has higher haemoglobin values and erythropoietin levels. It is imperative to note that in the kidney, there is a protein called hypoxia-inducible factor (HIF)-2 which activate erythropoietin production in oxygen tension environment (the blood). The erythropoietin production take place in the renal interstitial fibroblast- like cells which is the main source of erythropoietin use in regulating blood cells production (erythropoiesis) [34].

### **Bone Marrow**

Also convened as aplastic anaemia, or bone marrow failure, is more than anaemia as aplastic anaemia is a rare but serious blood condition that occurs when your bone marrow cannot make enough new blood cells for your body to work normally. It can develop quickly or slowly, and it can be mild or serious. Stem cells tend to manufacture blood cells such as red blood cells, white blood cells, and platelets within the bone marrow. In aplastic anaemia, stem cells are mostly damaged as a result of the bone marrow being empty (aplastic) or containing few blood cells termed hypoplasia[9].

Aplastic anaemia can present with Fatigue, Shortness of breath, Rapid or irregular heart rate, Pale skin, Frequent or prolonged infections, Unexplained or easy bruising, Nosebleeds and bleeding gums, Skin rash, Headache, and fever [20]. Aplastic anaemia can be short-lived, or it can become chronic and can be severe and even fatal. People with aplastic anaemia also have a rare disorder called paroxysmal nocturnal haemoglobinuria (PNH) which causes red blood cells to break down too soon [29]. Fanconi is a rare type of anaemia and is inherited leading to aplastic anaemia and children born with it tend to be smaller than average and have birth defects, such as underdeveloped limbs. The disease is diagnosed with the help of blood tests. It is also known better that the bone marrow begins to

demonstrate haematopoietic function during the 16<sup>th</sup> week of embryonic development when the haematopoietic function of the spleen and liver begins to gradually decline [35]. Up regulation of bone marrow haematopoiesis leads to increase in production of growth factors for stem cell mobilization of chemokines and upregulation of haematopoietic function in embryonic haematopoietic sites mainly the spleen and liver or other tissues, all of which occur in different pathological conditions.

### Conclusion:-

The date palm is a delicious, nutritious fruit with aphrodisiac, tonic and laxative effects that has been loved by people since ancient times. Dates are considered an ideal food and part of a balanced diet as they contain important nutritional information.

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