



Anticancer Activity of *Hylocereus undatus* Extract Through *in vivo* Studies

Ekhlās Mohammed Farhan¹, Alaa Saadi Abbood², Hussein kamel awad³,
Azhar Azher Alankooshi⁴, Reem Talib Ensai⁵, Ahmed Flayyih Hasan^{6,7}, Hany M. El-Wahsh⁸

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ABSTRACT

Background: *Hylocereus Undatus* Extract (HUE) It is obtained from the fruit of the white dragon fruit cactus and is rich in antioxidants and vitamin C, Among its benefits are providing environmental protection and reducing the appearance of wrinkles.

Methods: Forty female albino mice were divided for fifteen days into four groups: G1: Control , G2: HUE group with a dose of 200 mg/kg/body weight, G3: EAC group, G4: EAC + HUE Group, respectively.

Result: Our results from the third group showed that mice treated with cancer cells experienced a significant increase in the weight of mice, a increase in both ALT, AST, ALP and a decrease in both Albumin, total protein, as well as damage to liver tissue. When animals infected with cancer cells were treated with an extract of HUE, we observed an increase in the weight of mice, a decrease in both ALT, AST, ALP and an increase in both Albumin, total protein, as well as an improvement in liver tissue.

Key words: EAC, Eosin, HUE, Liver function, Mice.

INTRODUCTION

Cancer is a group of cancerous diseases brought on by the fast and unchecked proliferation of aberrant cells that can either multiply and mimic aberrant growth at other parts of the body or form lumps into tumors (Abdeen *et al.*, 2018).

It has been shown that liposomes or other biodistribution methods can transport boron to tumors selectively, which is a very practical way to raise the amount of boron in tumor tissues (Chumroenvithayakul *et al.*, 2025).

One of the most common cancers is Ehrlich ascites carcinoma (EAC). EAC is hyperdiploid at birth and is also referred to as an undifferentiated cancer, has a high potential for transplantation, does not regress, grows quickly and has a short lifespan (Hameed *et al.*, 2025).

Breast cancer is the second most common cause of death for women globally. According to reports, cardiovascular problems are the primary cause of death for people with breast cancer (Hasan *et al.*, 2023).

Hylocereus undatus (HU), has long been used to treat rheumatism and gout in Banyuwangi, East Java, Indonesia (Kanchana *et al.*, 2018).

Pitaya (*Hylocereus undatus*) is one of the less well-known tropical fruits, but it has significant commercial potential both domestically and internationally, which supports stepping up research primarily to gather fundamental data on farmer cultivation (Medhat *et al.*, 2017).

Commonly referred to as dragon fruit or pitaya, *Hylocereus undatus* is a highly valuable edible fruit and attractive plant. The fruit can be eaten raw or processed into various delicacies such as wine, juice, jelly, yogurt, jam and preserves (Abbood *et al.*, 2024).

¹Scientific Research Commission, Baghdad, Iraq.

²Iraqi Center for Cancer and Medical Genetic Research, Mustansiriyah University, Baghdad, Iraq.

³Unit of Environment and Prevention of Pollution, College of Science, University of Al-Qadisiyah, Diwaniyah, Iraq.

⁴Department of Human Physiology, Faculty of Medicine, Jabir Ibn Hayyan Medical University, Iraq.

⁵National Center of Hematology, Mustansiriyah University, Baghdad, Iraq.

⁶Biotechnology Research Center, Al-Nahrain University, Baghdad, Iraq.

⁷Department of Medical Laboratory Techniques, College of Health and Medical Technology, Al-Farabi University, Baghdad, Iraq.

⁸Department of Marine Biology, King Abdulaziz University, Faculty of Marine Sciences, King Abdulaziz University, Saudi Arabia.

Corresponding Author: Azhar Azher Alankooshi, Department of Human Physiology, Faculty of Medicine, Jabir Ibn Hayyan Medical University, Iraq. Email: azhar.azher@jmu.edu.iq

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Hylocereus undatus flower (HUF) is a type of traditional Chinese medicine used to treat digestive and lung conditions. Although our earlier research showed strong anti-inflammatory and anti-asthmatic effects, the precise mechanism is still unknown (Yi *et al.*, 2012).

The purpose of this study was to assess the potential for therapeutic use of bioactive substances derived from *Hylocereus undatus* leaf extract.

MATERIALS AND METHODS

Induction of EAC cells in female mice

EAC cells were gathered from Cairo University's National Cancer Institute in Egypt. About 2×10^6 EAC Cells female albino mice were injected intra-abdominally and the tumor was detected on the seventh day (Fig 1 and B) (Al-Khuzaay *et al.*, 2024).

Experimental design

Forty albino female mice weighing between (25-30 g) were collected and used in the research experiment. They were divided into four groups (G1-G4) respectively.

G1: Control group. G2: A group treated with HUE extract at a dose of 200 mg/kg orally for fifteen days. G3: A group treated with EAC Cells at a dose of 2×10^6 intraperitoneally on the first day only and left for fourteen days according to (Hasan *et al.*, 2024). G4: A group treated with EAC Cells on the first day and received treatment with HUE extract the following day for a period of fourteen days. On the fifteenth day, the experiment was concluded, the animals were anesthetized, euthanized and blood and liver samples were taken for physiological examinations.

Blood and tissue samples

Blood was drawn from each mouse via the inferior vena cava and separated in a central hemostat to obtain serum

and stored at a specific temperature for biochemistry examinations. About 0.8 gm of the liver was taken and stored in saline solution and the remaining part was preserved in formalin and used for histological examination.

Liver functions

The Biuret method was used to measure liver enzymes according to (Abd El-Rahmana *et al.*, 2024).

Histological examinations

Liver samples were kept in a solution of 10% formalin. Following cleaning and sectioning, hematoxylin and eosin staining was applied to the liver samples according to (Hameed *et al.*, 2025).

Statistical analysis

The statistical analysis used the SPSS program, developed by SPSS Inc. and the mean + standard deviation were used to examine the levels of indicators.

RESULTS AND DISCUSSION

Change of EAC or HUE on mice body and liver weights

Fig 2 shows the variations in the body and liver weights of the various experimental groups. Mice injected with EAC had significantly larger body and liver weights than the control group. However, EAC handling showed a significant

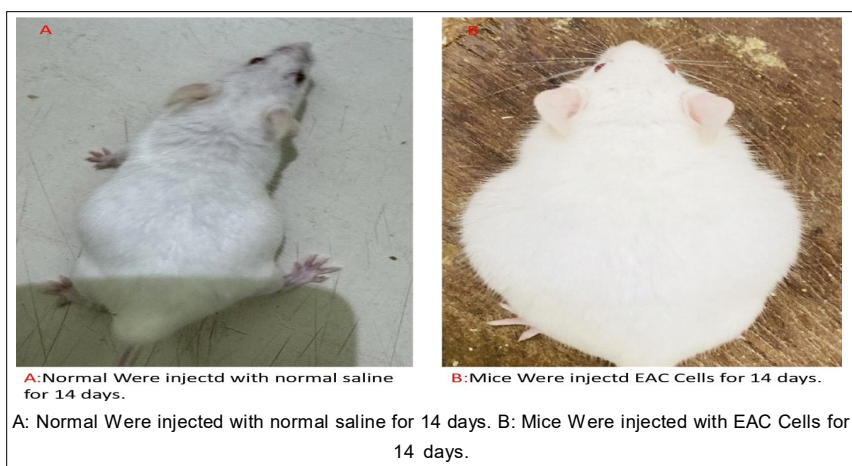


Fig 1: Effect of EAC cells on mice.

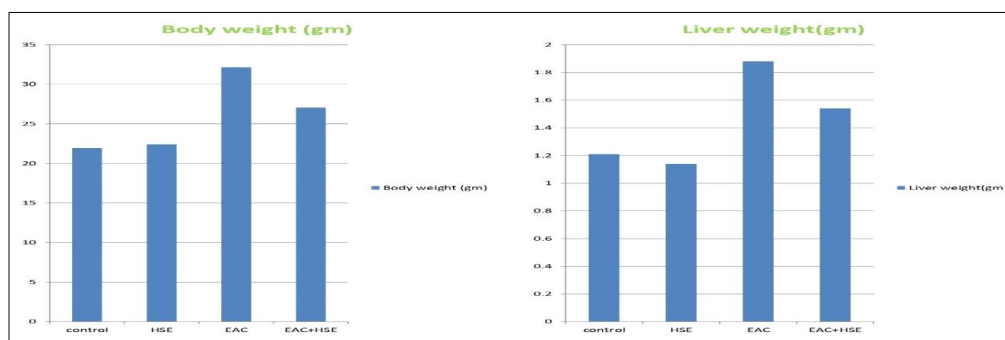


Fig 2: Effects of EAC and/or HSE in body and liver weights.

drop in mice using HUE. Body and liver weights in comparison to mice that have EAC.

Change of HUE on liver functions

When compared to the control group, Fig (3) showed that EAC significantly reduced albumin and total proteins while significantly raising ALT, AST, ALP and GGT levels. On the other hand, treatments of EAC with HUE (EAC+HUE) led to a considerable drop in ALT, AST, ALP and GGT and a large rise in albumin and total proteins.

Liver histopathology

The variations in liver tissue histology and morphometry among several populations are depicted in Fig 4. Both the control and HUE-treated mice's liver sections displayed polygonal liver cells with eosinophilic cytoplasm and big

round nuclei, indicating a typical hepatocyte framework. Hepatic sinusoids with finely arranged Kupffer cells are scattered between the hepatic cords (Fig 4A and 3B). Mice implanted with Ehrlich cells (EAC Gp) showed liver sections with extensively damaged hepatocytes, as evidenced by notable focal necrosis, significant degeneration, a marked cellular infiltration and congested blood sinusoids (Fig 4C). On the other hand, liver slices from EAC treated with HUE showed modest localised necrosis, mild vacuolated hepatocytes and a small amount of hepatocyte improvement (Fig 4D).

Through previous studies and research conducted on female mice, it is clear from our results that EAC cells cause a clear increase in weight (Fig 1 B) and an increase in the weight of the organs (Fig 2). These results are

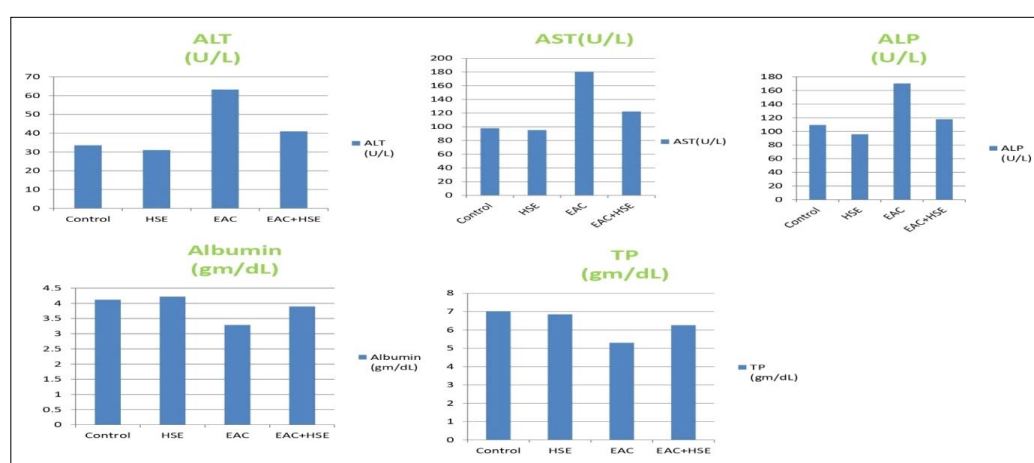


Fig 3: In experimental groups, changes in serum liver enzyme levels (ALT, AST, ALP, Albumine, total protein).

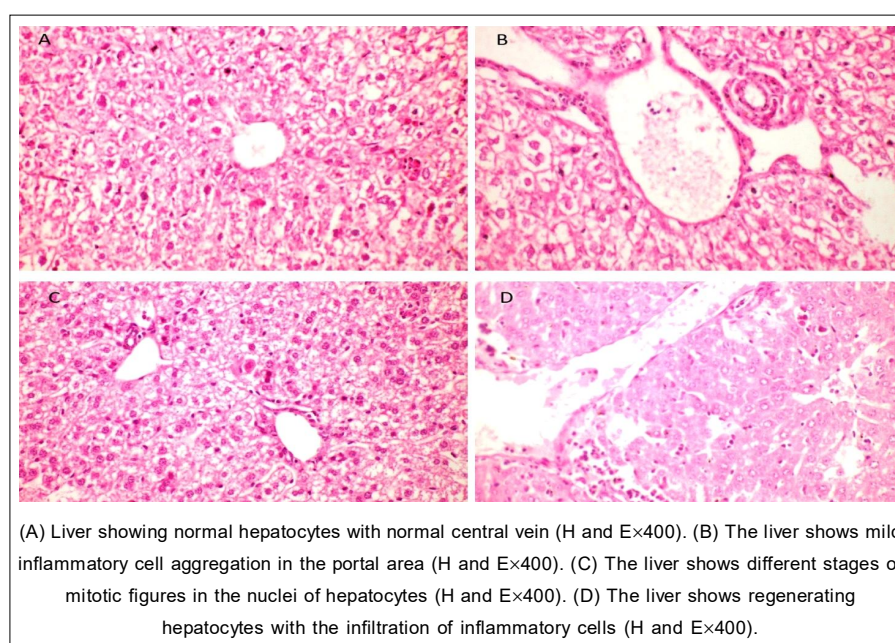


Fig 4: Representative photomicrographs of liver sections stained with HandE from different groups.

consistent with both Islam *et al.* (2013); Ali *et al.* (2022); when treating the cells carrying EAC cells with extract HUE we notice a decrease in the weight of the liver (Fig 2) and these results are consistent with Vaishnav *et al.* (2024); Fahriani *et al.* (2024), which proved that HUE causes an improvement in the liver.

It is also clear from our results that EAC cells cause a clear increase in liver enzymes ALT, AST and ALP and a decrease in Albumin, Total Protein (Fig 3) according to Gowda *et al.* (2022); Bhattacharyya *et al.* (2007); Ashokkumar *et al.* (2009); Abdeen *et al.* (2018) and when treating mice carrying EAC cells with HUE we notice a clear decrease in both ALT, AST, ALP and a near-normal increase in both Albumin, Total Protein (Fig 3) according to both (Fahriani *et al.*, 2024; Ho *et al.*, 2024).

Mice were injected with EAC cells and our results (Fig 4C) clearly show that they cause damage and destruction to liver tissue. Our results are consistent with those of Nasser *et al.* (2021); Tawfic *et al.* (2024); Sannappa Gowda *et al.* (2023), who demonstrated that EAC cells cause breakdown in liver tissue compared to normal tissue. Regarding the treatment of mice injected with EAC cells, we observed a slight improvement in liver tissue (Fig 4D) compared to the group of mice injected with EAC cells, according to Ghiath *et al.* (2025); Ibrahim *et al.* (2024), who demonstrated that the *Hylocereus undatus* Extract (HUE) improves liver tissue in mice.

CONCLUSION

We conclude from our study that EAC Cell causes toxicity in liver cells and that treatment with HUE shows a clear improvement. We suggest conducting future research on HUE.

Ethical approval

Obtained under approval from Al-Nahrain University in December 2024.

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Conflict of interest

The authors warrant that there is no conflict of interest between the authors.

REFERENCES

- Abbood, A.S., Faisal, A.J. and jawad Al-Imam, M. (2024). Effect of *Artemisia vulgaris* on liver of albino mice exposed to cisplatin. *Biomedical and Pharmacology Journal*. **17**(2): 1341-1346.
- Abdeen, S.H., Edrees, G.M. and Shalaby, E.M. (2018). Protective effect of proanthocyanidin on physiological and immunological disorders induced by ehrlich ascites carcinoma (EAC). *Sciences*. **8**(2): 583-593.
- Ali, H., Hasi, R.Y., Islam, M., Haque, M.S., Alkhanani, M.F., Almalki, A.H. and Yeasmin, T. (2022). Antioxidant, cytotoxic and apoptotic activities of the rhizome of *Zingiber zerumbet* Linn. in ehrlich ascites carcinoma bearing Swiss albino mice. *Scientific Reports*. **12**(1): 12150.
- Abd El-Rahmana, H.A., Hasanb, A.F., Alyasiric, T., El-Wahshd, H.M., Althubyanie, S.A., Basyonyf, M.A. and Mahmoodf, D.H. (2024). Co-treatment with cranberry and vitamin-C mitigates reproductive toxicities induced by phenobarbital in male rats. *Cell Physiol. Biochem*. **58**: 722-738.
- Al-Khuzaay, H.M., Al-Juraisy, Y.H., Hasan, A.F. and Tousson, E. (2024). Antitumor Activity of β -glucan isolated from date fruits in cancer cells *in vivo*. *Opera Medica et Physiologica*. **11**(3): 41-48.
- Ashokkumar, D., Mazumder, U.K., Gupta, M. and Selvan, V.T. (2009). Effect on inhibition of proliferation and antioxidant enzyme level of *Lippia nodiflora* in EAC cell line treated mice. *Journal of Complementary and Integrative Medicine*. **6**(1). doi: 10.2202/1553-3840.1233.
- Bhattacharyya, A., Mandal, D.P., Lahiry, L., Bhattacharyya, S., Chattopadhyay, S., Ghosh, U.K. and Das, T. (2007). Black tea-induced amelioration of hepatic oxidative stress through antioxidative activity in EAC-bearing mice. *Journal of Environmental Pathology, Toxicology and Oncology*. **26**(4): 245-254.
- Chumroenvidhayakul, S., Thilavech, T., Abeywardena, M.Y., Conlon, M., Dallimore, J., Adams, M. and Adisakwattana, S. (2025). Dragon fruit peel (*Hylocereus undatus*) modulates hepatic lipid metabolism and inflammation in a rat model of high-fat, high-fructose-induced metabolic dysfunction. *Antioxidants*. **14**(3): 319.
- Fahriani, E., Mylano, T.A. and Hutapea, J. (2024). Different Effects of *Hylocecarus polyrhizus* and *Hylocecarus undatus* extract on reducing total cholesterol of male rattus norvegicus wistar strain. *Journal La Medihealthico*. **5**(2): 299-308.
- Ghiath, Y., Mtashar, B.A., AL-Zuhairy, N.A.H.S., Hussein, M.S. and Hasan, A.F. (2025). Interplaying correlation of some genetic and inflammatory factors among patients with polycythemia vera. *Asian Journal of Dairy and Food Research*. 1-6. doi: 10.18805/ajdfr.DRF-492.
- Gowda, N.G.S., Shiragannavar, V.D., Prabhushwamimath, S.C., Tuladhar, S., Chidambaram, S.B. and Santhekadur, P.K. (2022). Ehrlich ascites carcinoma mice model for studying liver inflammation and fibrosis. *Advances in Cancer Biology-Metastasis*. **4**: 100029.
- Hasan, A.F., Jasim, N.A., Abid, A.T. and Tousson, E. (2024). Role of *Salvia hispanica* seeds extract on ehrlich ascites model induced liver damage in female mice. *Journal of Bioscience and Applied Research*. **10**(2): 161-169.
- Hameed, H.M., Razooki, Z.H., Hasan, A.F., Rasool, A.A.A.A. and Abed, I.J. (2025). Therapeutic effect of essential oils (*Citrus sinensis*) against ehrlich ascites model induced renal toxicity in female mice. *Agricultural Science Digest*. **45**(2). doi: 10.18805/ag.DF-632.
- Hasan, A.F., Alankooshi, A.A., Abbood, A.S., Dulimi, A.G., Mohammed Al-Khuzaay, H., Elsaedy, E.A. and Tousson, E. (2023). Impact of B-Glucan against ehrlich ascites carcinoma induced renal toxicity in mice. *Online Journal of Biological Sciences*. **23**(1): 103-108.

- Ibrahim, M.S. and Baker, L.A.A. (2024). Isolation and extraction of gallic acid from *Hylocereus undatus* and a biochemical and histological study on laboratory Wistar albino rats with induced rheumatoid arthritis. *Journal of Applied and Natural Science*. **16(1)**: 58-68.
- Islam, F., Ali, S.M.M. and Khanam, J.A. (2013). Hepatoprotective effect of acetone semicarbazone on ehrlich ascites carcinoma induced carcinogenesis in experimental mice. *Asian Pacific Journal of Tropical Biomedicine*. **3(2)**: 105-110.
- Kanchana, P., Devi, S.K., Latha, P.P., Spurthi, N. (2018). Phytochemical evaluation and pharmacological screening of antiparkinson's and laxative activities of *Hylocereus undatus* (White pitaya) in rodents. *IOSR Journal of Pharmacy*. **8(4)**: 78-92.
- Medhat, D., Hussein, J., El-Naggar, M.E., Attia, M.F., Anwar, M., Latif, Y.A. and El-Khayat, Z. (2017). Effect of Au-dextran NPs as an anti-tumour agent against EAC and solid tumour in mice by biochemical evaluations and histopathological investigations. *Biomedicine and Pharmacotherapy*. **91**: 1006-1016.
- Nasser, H.M., El-Naggar, S.A., El-Sayed Rizk, M.E.S.R., Elmetwalli, A. and Salama, A.F. (2021). A preliminary phase study is the effect of sorafenib on liver biochemistry before vitamin b17 coadministration in the Ehrlich ascites carcinoma mice model. *Biochemistry Letters*. **17(1)**: 40-49.
- Sannappa, G.N.G., Shiragannavar, V.D., Puttahanumantharayappa, L.D., Shivakumar, A.T., Dallavalasa, S., Basavaraju, C.G. and Santhekadur, P.K. (2023). Quercetin activates vitamin D receptors and ameliorates breast cancer-induced hepatic inflammation and fibrosis. *Frontiers in Nutrition*. **10**: 1158633.
- Tawfic, A.A., Ibrahim, H.M., Mohammed-Geba, K. and El-Magd, M.A. (2024). Chitosan nanoparticles, camel milk exosomes and/or sorafenib induce apoptosis, inhibit tumour cell migration and angiogenesis and ameliorate the associated liver damage in Ehrlich ascites carcinoma-bearing mice. *Beni-Suef University Journal of Basic and Applied Sciences*. **13(1)**: 74.
- Vaishnav, A., Mehta, F.T. and Patani, P. (2024). Anti-inflammatory and anti-oxidant effects of *Manilkara zapota* and *Hylocereus undatus*: A complete review. *Journal of Advanced Zoology*. **45(1)**. doi: <https://doi.org/10.53555/jaz.v45i1.3761>.
- Yi, Y., Zhang, Q. W., Li, S.L., Wang, Y., Ye, W.C., Zhao, J. and Wang, Y.T. (2012). Simultaneous quantification of major flavonoids in "Bawanghua", the edible flower of *Hylocereus undatus* using pressurised liquid extraction and high performance liquid chromatography. *Food Chemistry*. **135(2)**: 528-533.