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used for treatment in case of intoxication (feeding the intoxicated animal 11 to 33 fold the weight of the intoxicating plant). The apparently large dose of Khurfeish is not large in reality. Let's give an example of a 70 kg animal intoxicated with 35 mg of Defla (0.5 mg/ Kg of body weight is lethal to many animals as reported by Inchem, 2005), it should be given 385 mg to 1155 mg of Khurfeish which should be easily doable. The effect of Khurfeish, however, decreases as the Defla concentration increases. More research is of utmost importance using more ex vivo models, experimental animal (mice and rats) and eventually farms animals.

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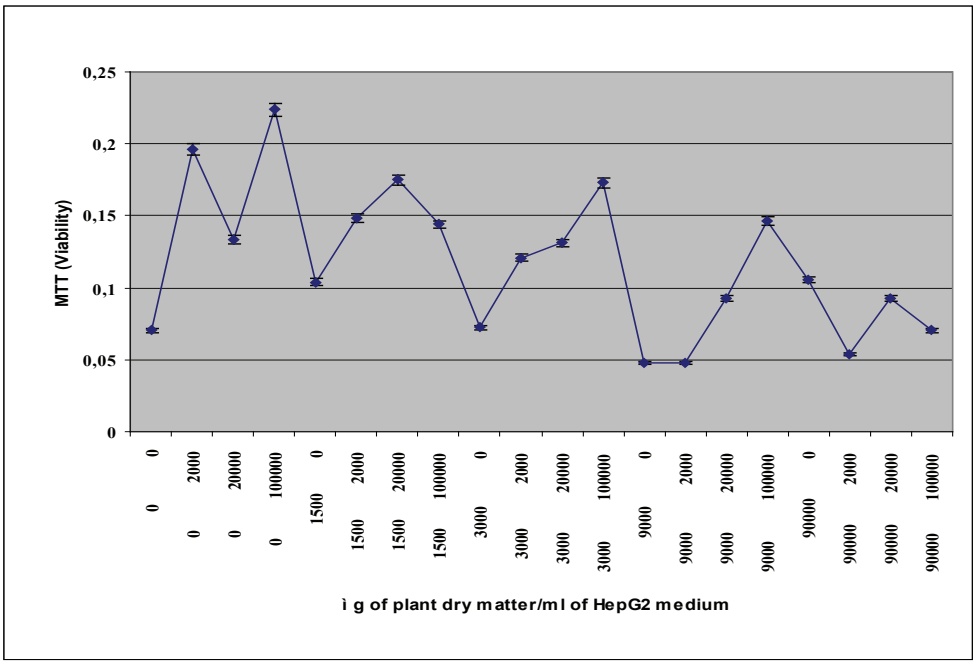
Figure (3)



To demonstrate the anti- toxicity effects of Silybum marianum (Khurfeish) when added with Nerium oleander (Khurfeish) on HepG2 cell line, different concentrations of these plants were added. Khurfeish has clear mitogenic effects when added alone on HepG2 cell line. Khurfeish possesses also clear antidotal virtues when added when Defla. The antidotal effect decreases as the concentrations of Defla increases. The concentrations down the figure are for Defla while the concentrations upper the figure are for Khurfeish as detailed in Table2.

Conclusions and Recommendations:

The grazing animals are badly influenced by the toxic plants in Palestinian ranges. This research starts to set up a technique based on evaluation of the effect of plant extract on cell cultures (ex vivo) and could start to study toxicity of plants for the first time in Palestine. Defla shows a clear toxic effect on HepG2 cell line in a direct proportionate manner and using two different assays (MTT and NO). Khurfeish demonstrate a promising ex vivo antidotal profile against the toxicity of Defla. Khurfeish could, therefore, be

Plant extract (s)	plant dry material/ ml of medium
Defla	9000
Defla+Khurfeish	9000 + 2000
Defla+Khurfeish	9000 + 20000
Defla+Khurfeish	9000 + 100000
Defla	90000
Defla+Khurfeish	90000 + 2000
Defla+Khurfeish	90000 + 20000
Defla+Khurfeish	90000 + 100000

The plant extract(s) concentrations added to HepG2 cell line to assess the antidotal virtues of Khurfeish versus the toxicity of Defla. In case of applying two plant extracts, concentrations are ordered respectively. These values are expressed in μg of plant dry material/ml of RPMI medium. The effect was measured using the viability assay, MTT (results are shown in figure 3).

Concerning the virtues of Khurfeish, an interesting and promising profile is demonstrated in Figure 3. Firstly, Khurfeish shows a clear mitogenic effect on HepG2 cell line. This mitogenic effect is directly proportional to the Khufeish concentration used. Secondly, a clear inverse relationship between the Defla concentration used and the viability values obtained for HepG2 is demonstrated. This confirms the results obtained in Figure 1 and 2. Thirdly, a clear antitoxic effect of Khurfeish on Defla is shown. This effect is clear at Defla and Khufeish concentrations of 1500 and 20000, 3000 and 100000 as well as at 9000 and 100000 μg of plant dry matter/ ml of RPMI medium respectively. It might be concluded that in case of intoxication with Defla (and possibly with other toxic plants), a possible treatment can be envisaged using Khurfeish plant weighing about 11 to 33 fold the weight of the intoxicating plant. However, at larger Defla concentrations (e. g. 90000 μg of plant dry matter/ ml of RPMI medium), Khurfeish has no longer antidotal capacity in HepG2 cell line. This could demonstrate the importance of treating intoxication in the early stages even if the ideal situation is to completely avoid intoxication. These values need, however, to be verified and validated in other ex vivo systems as well as ultimately in vivo investigations.

Assessment of the antidotal virtues of Khurfeish (Silybum marianum) using MTT assay:

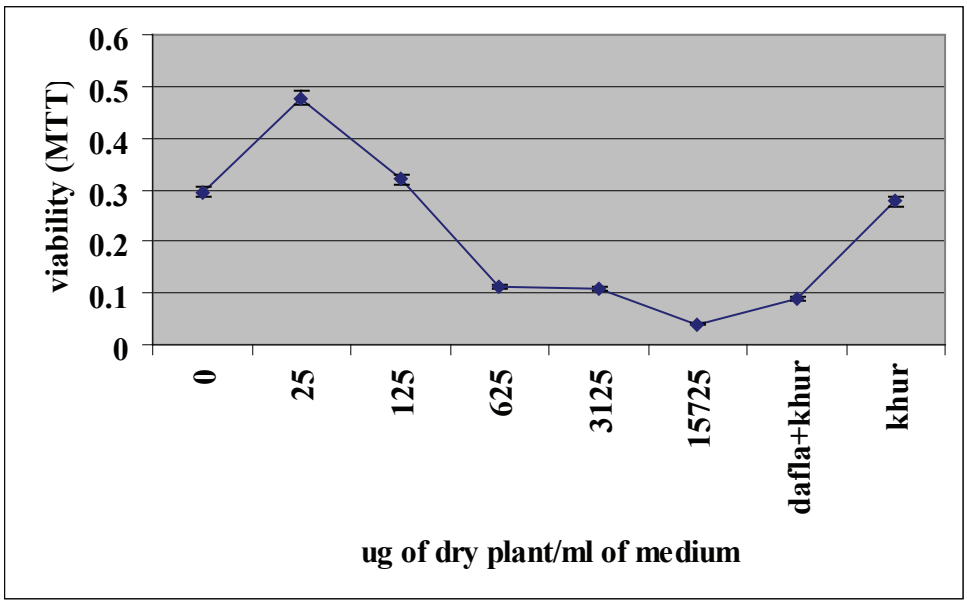
Silybum is recognized in the literature as a cell regenerative agent. Silybum marianum is reported to possess antidote and liver regeneration virtues (Flora et al., 1998; Luper, 1998; Buzzelli et al., 1993; Vailati et al., 1993; Lirussi and Okolicsanyi, 1992; Wagner, 1981; Magliulo et al., 1978; Bode et al., 1977; Desplaces, 1975; Anonymous, 1999) and could, therefore, be as an antidote herb for intoxicated animals. This was an application horizon for our study. So hepatic cells treated with toxic plant extract are also treated with Silybum marianum extract in order to evaluate its antidote and liver regeneration capacities. As a control, Silybum marianum was added alone and in combination with the toxic plants extract. Unexpectedly, Silybum marianum failed to prove the cell regeneration virtues when added with Defla at the concentrations used in figures 1 and 2 (10000 and 3125 µg of plant dry material/ ml of RPMI medium respectively). Therefore, further concentrations were used (Table 2) and showed a convincing antidotal pattern (Figure 3).

Table (2)

Plant extract (s)	plant dry material/ ml of medium
No plant	0
Khurfeish	2000
Khurfeish	20000
Khurfeish	100000
Defla	1500
Defla+Khurfeish	1500 + 2000
Defla+Khurfeish	1500 + 20000
Defla+Khurfeish	1500 + 100000
Defla	3000
Defla+Khurfeish	3000 + 2000
Defla+Khurfeish	3000 + 20000
Defla+Khurfeish	3000 + 100000

Khurfeish, concentrations will be adjusted in the following sections. However, MTT assay has proved to be more «precocious» in detecting the toxic effects of Defla. At 625 µg of plant dry matter /ml medium, the MTT (cell viability) value is 1/3 the negative control while using the NO assay, there is just a slight negative effect on the growth. Therefore, MTT only will be considered for the next investigation concerning the antidotal effects of Khurfeish.

Figure (2)



Different plant extracts were added to evaluate their effect on the hepatic cell line (HpG2). A mitogenic effect of Defla at 25 µg of plant dry material/ml of RPMI medium and a slight mitogenic effect are demonstrated at 125 µg of plant dry material/ml of RPMI medium. A clear toxic effect is demonstrated at 625 µg of plant dry material/ml of RPMI medium with a stabilization plateau until 3125 µg of plant dry material/ml of RPMI medium. The maximum toxic effect of Defla is at 15725 plant dry material/ml of RPMI medium. Khurfeish, when applied alone at 10000 µg of plant dry material/ml of RPMI medium has a rather slight negative effect on growth of cells, unexpectedly. No antidotal effect of Khurfeish at the used concentration was detected (10000 and 3125 µg of plant dry matter /ml medium for Khurfeish and Defla respectively).

It's demonstrated in figure 1 (which measures the mortality of cells using the NO assay) that applying 25, 125 and 625 µg of plant dry matter /ml medium has a slight negative effect on the growth of HepG2 cell line. A stronger antigrowth effect is demonstrated at 3125 µg of plant dry matter /ml medium. The toxic effect reaches a maximum point at 15725. No more concentrations were used which means that this was not an absolute maximum toxicity level. Besides the main purpose of the experiment in figure 1 (revealing the toxic concentrations of Defla extract), a trial was made to measure the antidotal virtues of Khufeish (Silybum marianum) when added with Defla (Nerium oleander). These plants were added at 10000 and 3125 µg of plant dry matter /ml medium respectively. No antitoxic virtues could be detected at the used concentrations. Furthermore, Khufeish failed to demonstrate any growth stimulation at the used concentrations (table 1 and Figure 1). A further range of concentrations will be used in the next sections (table 2, Figure 2 and Figure 3).

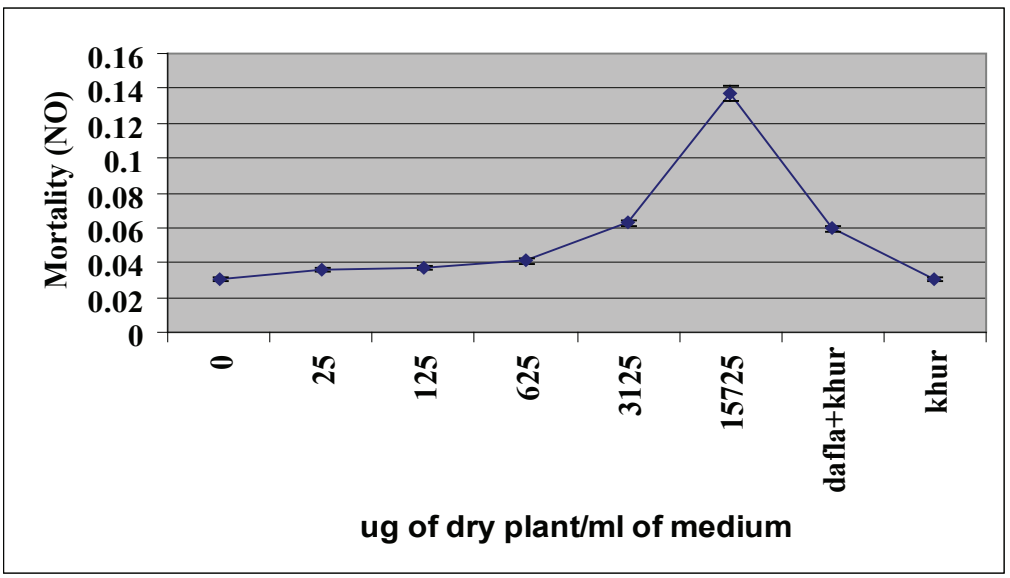
Toxicity of Defla on HepG2 cells using MTT assay:

To confirm results obtained using the NO assay, MTT assay was employed to assess the toxic doses of Defla as well as to have a first impression of the anti-toxicity of Khurfeish (Figure 2). The same plant extract concentrations listed in table 1 were applied to hepG2 cell line. A series of experiments composed of up to 12 replicates was performed in HepG2 cell line and gave the profile shown in figures 2. As the results in figure 1, the maximum toxicity could be detected at 15725 µg of plant dry matter /ml medium. However, unexpectedly, a strong mitogenic effect of Defla on hepG2 cell line was detected at 25 µg of plant dry matter /ml medium, a slight mitogenic effect appears at 125 µg of plant dry matter /ml medium. At higher concentrations, a clear toxic effect of Defla is demonstrated (at 625 and 3125 µg of plant dry matter /ml medium where the toxic effect is almost the same). The maximum toxic effect was obtained at the highest concentration of Defla used (15725 µg of plant dry matter /ml medium). In the same manner as upon using the NO assay, this does not mean necessarily that this concentration is the absolute highest toxic concentration of Defla. In the same manner as figure 1, Khurfeish failed to show any antitoxic effect when applied with Defla at 10000 and 3125 µg of plant dry matter /ml medium respectively. Other concentrations will be assayed in the following sections. Khurfeish also shows an unexpected slight growth inhibition effect on HepG2 cell line. Therefore, for the virtues of

Plant Extract (s)	µg of plant dry material/ ml of medium
Defla	625
Defla	3125
Defla	15725
Defla+Khurfeish	3125 + 10000
Khurfeish	10000

The concentrations of plant extracts(s) added to HepG2 cells. In case of applying two plant extracts, concentrations are ordered respectively. The effects were measured using the mortality assay, NO and the viability assay, MTT (results are shown in figures 1 and 2 respectively)

Figure (1)



When applying increasing concentrations of Defla to HepG2 cell line, a slight toxic effect is demonstrated up to 625 µg of plant dry material/ml of RPMI medium. Then a clear toxic effect is demonstrated at 3125 and the effect attains its maximum at 15725 µg of plant dry material/ml of RPMI medium. Adding Khurfeish with Defla at 10000 and 3125 µg of plant dry material/ml of RPMI medium respectively shows no antidotal effect of Khurfeish.

terms of mortality and expressed as absorbance at 550 of NO. After 24 hrs of HepG2 cells incubation with the plant extract(s), 50 µl of the medium was mixed with 100 µl of reagent B (1% wt/v sulfanilamide, 3% v/v H_3PO_4 in distilled water), then further mixed with 100 µl of reagent A (1% wt/v Naphtylethylendiamine dihydrochloride in distilled water and stored at 4ºC). The mixture was then incubated at RT for 20 min. The effect was measured in form of absorbance at 550 nm using ELISA plate reader (Ignarro et al., 1987; Adamson and Billings, 1993).

Statistical Analysis:

A series of experiments was conducted using plant extracts from Defla and/or Khurfeish in the concentration and combinations detailed in tables 1 and 2. The variables tested were the viability and/or the mortality of cells due to the plant extract(s) determined by MTT and NO assays respectively.

Error limits cited and error bars plotted represent simple standard deviations of the mean. Usually, numerical results are only accurate enough to specify the least significant digit. When comparing different samples, results were considered to be statistically different when $P < 0.05$ (Student's t- test for unpaired samples).

Results and Discussion:

Toxicity of Defla on HepG2cells using NO assay:

To detect the toxic doses of Nerium oleander (Defla), a range of plant extract concentrations was added to HepG2 cell line. The concentrations are shown in Table 1. Up to 12 replicates were performed and gave the profile shown in figure 1. The effect was measured through the cell mortality test (NO).

Table (1)

Plant Extract (s)	µg of plant dry material/ ml of medium
No plant	0
Defla	25
Defla	125

animals (Behnia et al., 2000; Lerche et al., 1997). Any measured plant toxicity on HepG2 can, therefore, be expected to appear in the whole organism. Consequently, results should be useful for future research into plant toxicity in animals.

Hepatic cells treated with toxic plant extract were also treated with Silybum marianum extract in order to evaluate the antidote and liver regeneration capacities of Silybum marianum. As controls, the toxic plant was added alone, Silybum marianum was added also alone and in combination with the toxic plants extract.

To study the antidotal virtues of Silybum marianum (Flora et al., 1998; Luper, 1998; Buzzelli et al., 1993), this plant was added to HepG2 in parallel to the toxic plant, the controls were HepG2 without any plant extract, HepG2 with Silybum marianum, and HepG2 with the plant extract. The concentrations of each plant in terms of µg of plant DM/ ml of medium are shown in table 2 and figure 3.

MTT Assay:

The MTT assay was performed to assess the effect of the plant extracts on the viability and proliferation of cells (according to Raju et al., 2004 and Saad et al, 2005). MTT [3- (4, 5- dimethylthiazol- 2- yl)- 2, 5- diphenyltetrazolium bromide] standard colorimetric assay, first described by Mosmann in 1983, is based on the ability of a mitochondrial dehydrogenase enzyme from viable cells to cleave the tetrazolium rings of the pale yellow MTT and form a dark blue or purple formazan crystals which is largely impermeable to cell membranes, thus resulting in its accumulation within healthy cells. Solublization of the cells by the addition of a detergent results in the liberation of the crystals which are solublized. The number of surviving cells is directly proportional to the level of the formazan product created. The color can then be quantified using a simple colorimetric assay. The results can be read on a multi- well scanning spectrophotometer (ELISA reader) at 570 nm.

NO Assay:

The idea of this assay depends on the quantification of mortality of cells based on the nitric oxide (NO) produced by dead cells. The effects of different concentrations of Defla were assayed on HepG2 cell line using this mortality assay (as described by Ghareeb et al., 2008). The effects are measured in

Materials and methods:

Plants were collected from different locations in Jenin area located in the northern Palestinian Territories and were pooled for extraction. Only leaves were extracted.

Preparation of Plant Extracts:

The plants were harvested in March and April and were dried in shadow at room temperature and the leaves were taken for extraction. In order to extract the organic as well as the non organic extracts, ethanol (50% water) was added to leaves which were finely smashed using a kitchen blender. This mixture was then boiled for 15 minutes with stirring. The filtrate was then taken and freeze- dried and diluted in a Phosphate Buffered Saline (PBS) buffer and preserved at –20°C. The concentrations used throughout this manuscript are described as weight of plant dry matter (µg) in the medium volume unit (ml), where cells were grown (as described by Ghareeb et al., 2008, Ghareeb et al., 2007, Saad, 2005, and Saad et al., 2005).

Cell Culture:

HepG2 cell line retains differentiated parenchymal functions of normal hepatocytes, including the expression of P450 isoenzymes (Medina- Diaz et al., 2006) thus permitting long- term studies to be performed. The cells were grown in Dulbecco's modified Eagle's medium (RPMI) with a high glucose content (4.5 g/L) supplemented with 10% vol/vol inactivated fetal calf serum, 1% nonessential amino acids, 1% glutamine, 100 U/ml penicillin, and 10 mg/m1 streptomycin. Cells were maintained in humidified atmosphere with 5% CO_2 at 37°C. The medium of cells was changed twice a week. At 70–80% confluence, cells were trypsinized and seeded in 96- well plates in cell density of $1.5x10^4$ HepG2 cells. Twenty four hours after cell seeding, cells were exposed to various concentrations of the plant extracts in fresh serum- free medium.

We present in this report the profiles of viability of cells under the effect of plant extracts using suitable controls; HepG2 cultures without any plant treatment (as described by Ghareeb et al., 2007, Ghareeb et al., 2008).

Furthermore, the hepatic cell line HepG2 was chosen for this study because the hepatic cells are known to represent the detoxification center of

addition, Defla is reported to contain nerioside, oleandroside, saponins, which are toxic for humans, horses, cattle, sheep, goats and dogs. All plant parts are poisonous (http: //www. ansci. cornell. edu/plants/). They are present in all parts of the plant, but are most concentrated in the sap. It is thought that Oleander may contain many other unknown or un- researched compounds that may have dangerous effects (Inchem 2005). Oleander bark contains rosagenin which is known for its strychnine- like effects. The entire plant including the milky white sap is toxic and any part can cause an adverse reaction.

Different names for Oleander are used around the world in different locations, so when encountering a plant by any of these names, care and caution should be used. Many of Oleander's relatives have similar leaves and also contain toxic compounds.

Bnouham et al., 2002 review, however, that Ferula communis (Kalakh) and Nerium oleander (Defla) and other plants known to be toxic can have, astonishingly, antidiabetic effects, but this information has to be vitally verified as these plants are known to be highly toxic!

Finally, Silybum marianum (Khurfeish) is recognized in the literature as a cell regenerative agent. It is reported to possess antidote and liver regeneration virtues (Luper, 1998; Buzzelli et al., 1993; Vailati et al., 1993; Lirussi and Okolicsanyi, 1992; Wagner, 1981; Magliulo et al. (1978); Bode et al., 1977; Desplaces, 1975; Anonymous, 1999). In this study, the antidotal virtues of Silybum marianum will be assayed in cells for possible future antidotal applications on intoxicated animals.

Objectives:

I. Putting a basis for the evaluation of toxicity of many plants in the Palestinian environment through the study of the level of toxicity of Nerium oleander (Defla) to the hepatic cell line HepG2 and ultimately to grazing animals.

II. Assaying the antidotal virtues of Silybum marianum (Khurfeish) using HepG2. This should guide a future research in vivo and might provide our farmers with a free antidote in case of intoxication.

III. The applications of this study are not only agricultural and economical but also environmental and political for Palestinians. The protection of farmers and their production and avoiding losses are vital to protect land.

Ingestion can cause both gastrointestinal and cardiac effects. The gastrointestinal effects can consist of stomach and abdominal pains, nausea and vomiting, excess salivation, diarrhea that may or may not contain blood, and especially in horses, colic (Inchem 2005). Cardiac reactions consist of irregular heart rate, sometimes characterized by increasing perspiration and a racing heart at first that then slows to below normal further along in the reaction. The heart may also beat erratically with no sign of a specific rhythm. Extremities may become pale and cold due to poor or irregular circulation. Reactions to poisonings can also affect the central nervous system. These symptoms can include drowsiness, tremors or shaking of the muscles, seizures, collapse, and even coma that can lead to death. Oleander sap can cause skin irritations, severe eye inflammation and irritation, and allergy reactions characterized by dermatitis (Goetz, 1998). Intoxication symptoms include also anoxia, bloody diarrhea, and loss of consciousness and might end with death (Steyen, 1934 as reviewed by Abu Rmeileh, 2000). It was also found that oleander toxins cause hemoagglutination of intravascular red blood cells and directly lysis of red blood cells (Kalapodi et al., 2006).

Poisoning and reactions to Oleander plants are evident quickly, requiring immediate medical care in suspected or known poisonings of both humans and animals (Goetz, 1998). Induced vomiting and gastric lavage (wash) are protective measures to reduce absorption of the toxic compounds. Charcoal may also be administered to help absorb any remaining toxins (Inchem 2005). Further medical attention may be required and will depend on the severity of the poisoning and symptoms.

In general, plants toxic substances are classified as alkaloids, cyanogenic glycosides, cardiac glucosides as oleandioside found in Nerium oleander (Defla), saponins, toxic organic acids, selenium (Se), photosenstizers, oxalates, resins and resinoids, proteins and polypeptides, nitrates and nitrites, photosensitizers and finally mineral elements (Sankari, 1978; Jaffe, 1972 and Kingsbury, 1964).

Among the toxic substances and secondary compounds of Defla (Nerium oleander), the most significant are oleandrin and neriine, which are cardiac glycosides (Goetz, 1998). Cardiac glycosides are naturally occurring plant or animal compounds whose actions include toxic effects on the heart, but astonishingly reported to have beneficial effects on the heart (Desai 2000). This latter piece of information has, however, to be seriously checked. In

Introduction:

Braighith (1998) reported that out of the total rangeland area of about 218, 000 (ha) in the Palestinian territories; only 70, 000 (ha) were accessible to Palestinians. Poverty of farmers caused by many factors including occupation, resulted in overgrazing and bad use of trees and shrubs in ranges (Mohammad, 2005). Recognition of toxic and unpalatable plants is, therefore, of vital importance for a better grazing management and consequently, avoiding animals suffering and deaths as well as increasing the productivity. Recognition must be based on a scientific rather than on a hearsay basis. The example of Elik (Cichorium pumilum) which is reported to intoxicate sheep is illustrative. The poisoning symptoms are said to appear also in the indoor-kept sheep and goats. If Elik is really poisonous, what parts of the plants are toxic and under what circumstances?

Plant toxic to animals are in general also toxic to human. Some plants toxic to animals were, however, found to be safe for humans. Toxic compounds can render plants unpalatable especially at high concentrations. But the danger comes from eating plants "mildly" poisonous plants and also high in nutrients. Animals eat such plants rather than starve but this might lead eventually and by accumulation to death.

The toxicity of Oleander genus including Defla (Nerium oleander) is considered extremely high and it has been reported that in some cases only a small amount had lethal or near lethal effects. Consumption of one leaf is sufficient to kill human being specially children (Goetz, 1998). West (1957) reported that many individuals were intoxicated after a barbeque where Nerium oleander containing wood was used! Oleander is also known to hold its toxicity even after drying. All animals (sheep, horses, cattle…) can suffer a reaction or death from Defla.

In animals, around 0.5 mg/ Kg of body weight is lethal to many animals, and various other doses will affect other animals (Inchem 2005). Horses were reported to become ill when they are poisoned with toxic leaves of Nerium oleander (Trevino, 2009). Plant clippings are especially dangerous to horses, as they are sweet. 100 g of Defla were reported to kill an adult horse (Knight, 1999). Defla is toxic for horses and cows at 0.005% (plant weight/animal weight) and at 0.015% for sheep and goats (reviewed by Abu Rmeileh, 2000).

Abstract:

Assessment of toxicity of plants in the Palestinian ranges and looking for antidotal range plants have vital economical, ecological and also political importance. This research aims to evaluate the toxicity of Nerium oleander (Defla) and the antitoxic capacity of Khurfeish in HepG2 cells. A series of concentrations of plant extracts were added to HepG2 and the effect was evaluated using the MTT viability and NO mortality assays. As the concentration of Defla increases, the viability of HepG2 cell line decreases to attain its minimum at 15725 μg of plant dry matter/ ml of RPMI medium using both assays. Unexpectedly, a growth enhancer effect was found at the Defla concentration of 25 μg of plant dry matter/ ml of RPMI medium using the MTT assay.

Khurfeish was assessed for its antidotal effects when combined with Defla. The effect of Khurfeish alone on HepG2 cell line showed to be mitogenic. This effect is in general proportionate to the concentration of Khurfeish. When combined with Defla, Khurfeish was found to have an antidotal effect against the toxicity of Defla. Promising antidotal effects of Khurfeish were obtained when added with Defla at the following concentrations respectively (20000 and 1500, 100000 and 3000, 100000 and 9000 μg of plant dry matter/ ml of RPMI medium). The antidotal effect, in general, decreases as the concentration of Defla increases. However, at the Defla concentration of 90000 μg of plant DM/ ml of medium, Khurfeish, no longer shows anti- toxicity virtues. This might demonstrate the efficiency of treating intoxication at early stages. Based on the mentioned values and in case of intoxication of farm animals by Defla, it could be useful to counteract the toxicity by feeding with Khurfeish of about 11 to 33 equivalent of the Defla weight. For ultimate validation of these results, experiments should be conducted in vivo using small animals then farm animals.

Key words:

Toxicity, grazing animals, Nerium oleander (Defla), Silybum marianum (Khurfeish), antidote

ملخص:

إن الحاجة ماسة لتقدير سمية بعض النباتات وتقدير مضادية السمية في نباتات أخرى في البيئة الفلسطينية ولهذا أهمية اقتصادية وبيئية وسياسية. يهدف هذا البحث لتقدير سمية الدفلة للخلايا الكبدية إضافة إلى تقييم قدرة مكافحة السمية في نبات الخرفيش عند إضافته مع الدفلة للخلايا وعند إضافة مستخلص نبات الدفلة إلى سلالة خلايا كبدية. رَكَّز البحث على فَحْص أثر النبات عن طريق تقدير الخلايا الحية المتبقية (MTT) أو بواسطة تقدير الخلايا الميتة (NO). تشير النتائج إلى ارتفاع السمية بارتفاع تركيز نبات الدفلة حتى وصلت أعلى مستوى على تركيز ١٥٧٢٥ ميكرو غرام/مل من الوسط المغذي. لكن وبخلاف التوقع، لوحظ ارتفاع في حيوية الخلايا على تركيز دفلة يساوي ٢٥ ميكرو غرام/مل من الوسط المغذي.

وبالنسبة للخرفيش، فقد أظهر أثرا تحفيزيا لنمو الخلايا يتناسب طرديا مع تركيز الخرفيش، ولأجل قياس قدرة الخرفيش على مقاومة سمية الدفلة فقد أضيفا معا، وظهر أثر مقاوم للسمية على التراكيز التالية للنباتين على الترتيب (٢٠٠٠٠ و ١٥٠٠، ١٠٠٠٠٠ و ٣٠٠٠، ١٠٠٠٠٠ و ٩٠٠٠) ميكرو غرام/مل من الوسط المغذي. إلا أن هذا الأثر انعدم على تراكيز دفلة عالية (٩٠٠٠٠ميكرو غرام/مل من الوسط المغذي) مما قد يعني وجوب علاج التسمم في مراحله الأولى عن طريق إطعام الحيوانات المسممة بالدفلة خرفيشاً يعادل ١١ إلى ٣٣ ضعف وزن الدفلة بناء على القيم المذكورة. إن الإقرار النهائي لنتائج هذا البحث بحاجة إلى مزيد من التجارب على الحيوانات الصغيرة ابتداء ثم على حيوانات المزرعة.

الكلمات الدالة:

سُمِّية، حيوانات الرعي، دفلة، خرفيش، مضاد سمية (تُرْياق)

Ex vivo assessment of Nerium oleander (Defla) toxicity and Silybum marianum (Khurfeish) antidotal virtues

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