



## EXCERPTS FROM THE ADDRESS OF HRH PRINCE EL HASSAN BIN TALAL DURING THE INTERNATIONAL SEMINAR ON SOLAR ENERGY MIX<sup>1</sup>



- The era of cheap energy has been over for some time and will continue to be so well into the distant future until renewable energy becomes feasible. This means that both industrial and developing countries are going to be forced to enter a new era involving renewable mixes of energy consumption patterns. This transitional stage will be particularly painful for developing countries which are now trying to accelerate their socio-economic development in the new era of more expensive energy. On the other hand, industrial countries which made their long economic strides during the era of cheap fuel, will also face the challenges of curbing their energy consumption appetites while maintaining their high standards of living. The future options for more energy supply are numerous ,but few besides solar and wind energies provide rational and sustainable solutions.
- In the case of developing countries, which consume only 20% of the global energy, the option to move towards nuclear energy is not rational because of the technology and the capital required. Large hydro-power projects are possible, but the large capital required and the fact that potential rivers cross several countries pose many difficulties. Furthermore, further expansion in the use of fuelwood should not only be prevented, but it should be curbed down,

because current fuelwood consumption is around five times the rate of planting trees. All this points to the fact that solar and wind energies are among the best rational options.

- So far I mentioned issues related to the need for more energy sources, but the real challenge lies in the manner in which energy is distributed and consumed .I have declared on many platforms that development components--man, land, and resources--should be employed for human development to provide dignity and social justice. In other words we should give a priority to decrease human misery of the masses of people throughout developing countries before we attempt at increasing the happiness of the few.
- This leads us to mention a few of the current and unfortunate disparities. Around %80 of the global energy is consumed by industrial countries which constitute % 20 of the world population, yet developing countries possess 82% of the world oil reserves. Disparities also exist within developing countries where the rural population forming 65% of the population consumes only 35 % of the energy consumed in these countries.
- In summary, the matrix approach suggests that long-lasting solutions and prosperity in the region can only come true if the baskets of energy, water ,environment, democracy, refugees, disarmament, mass demographic movements, and labour, including labour compensatory facility, can be treated as interactive components of one regional system where the whole region takes a share in providing the necessary input for development. This approach makes sense ,because great disparities create conflicts and investment in peace creates progress for all.

<sup>1</sup> From the proceedings of the international seminar on Solar Energy Commercialization held in Amman, Jordan in 1992.

## SUSTAINABLE DEVELOPMENT IN A BALANCED ECOSPHERE

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Sustainable development is now considered to be the answer to the dilemma of economic growth versus environmental quality.

There have been many definitions of sustainable development, not all of which are accepted by all the partisans of the concept. But it can be safely said that a reasonable definition of sustainable development to which almost all could subscribe will be that there are no "free goods" of nature which classical economists used to distinguish from "economic goods". Free goods of nature were so abundant that they had no price, in other words, no decisions about alternative uses were needed. 'Economic goods' were scarce; they had a price which was determined by the various uses to which they could be put. Using a resource for one purpose meant forgoing its use for another purpose. All resources at the present point in the evolution of economic life are scarce. They all have opportunity costs, even air and water, the classical examples of "free goods".

Secondly, if scarce resources are to be used in a sustainable manner, renewable resources should be used at a rate where they can be replaced over time. Non-renewable resources could be used at a rate of efficiency which could be equal to or greater than the rate of extraction of the resource to its deposits. As an example, one can think of

oil being extracted at a given quantity each year say  $x\%$  of the known reserves. If efficiency in its use rises to  $x\%$  or above annually that is to say  $x\%$  less oil is needed to produce the same amount of goods, then, oil consumption at this rate could be indefinitely sustainable.

For a renewable resource such as timber from the forests, if  $x\%$  of trees are cut down in say 10 years, and if in the same 10 years  $x\%$  of new trees grow and become available to be cut, the rate of exploitation is sustainable indefinitely.

Such examples are, of course, only heuristic instruments for rational decision making, the reality will always fall short of the theoretically formulated possibility. Nevertheless, it can be concluded that the vocation of all technological progress is the increase in the quantitative and technical efficiency with which inputs are used and the central purpose of economics is to optimize the qualitative social efficiency of the allocation of resources to alternative ends. By qualitative social efficiency is meant the maximum satisfaction of human wants with the minimum use of available resources at a given state of technical knowledge. The improvement in efficiency of technology is the vocation of technological research and that of socio-economic research is to make use of that improved technical knowledge for the improvement of material welfare of mankind. This is nothing new but is wholly consistent with what has been called the quest for sustainable development. The question whether economic growth should be zero or some other figure and at what rate natural resources should be exploited will be decided in the light of the advancing technological possibilities and changing conceptions of human welfare, whatever they may be in the future.

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# FÖRSTER RESONANCE ENERGY TRANSFER (FRET)

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The nature of excitation energy transfer between two fluorescing molecules (chromophores) was found to depend on the distance separating them, **Förster**. Whereas at remote distance separating the two chromophores, i.e.  $d \gg \lambda$ , where  $\lambda$  is the wave length of the emitted florescence band of the donor molecule, the quantum mechanical description of energy transfer process applies, i.e. emission-absorption process, Figure 1. The transfer process is different at shorter intermolecular distance, i.e.  $d < \lambda$ . In such cases an overlap is expected between the emission band of the donor molecule and the absorption band of the acceptor chromophore, Fig.2.

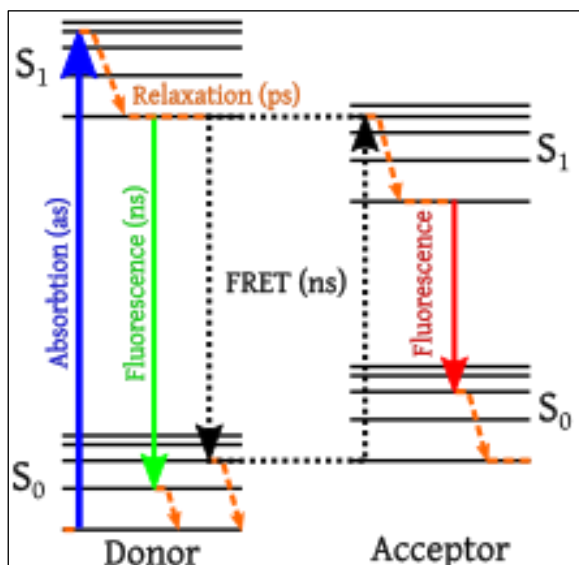


Figure 1. Quantum mechanical description of the energy transfer process. (Source: Wikipedia).

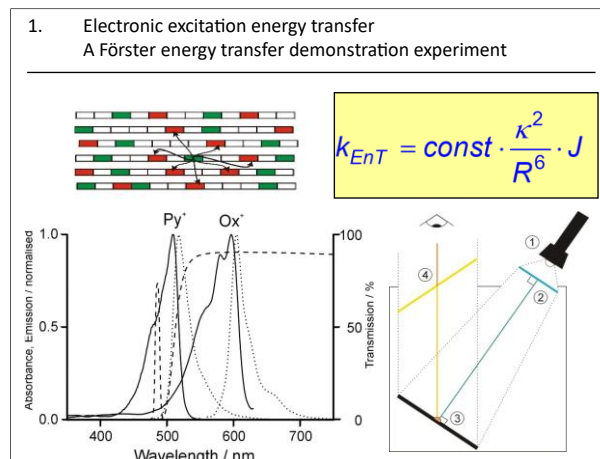


Figure 2. a Förster energy transfer demonstration experiment.

The energy transfer rate is found to depend on the inverse of the sixth power of the distance separating the Donor-Acceptor molecules. The nature of this type of energy transfer was derived by **Förster** to be of a dipole-dipole interaction.

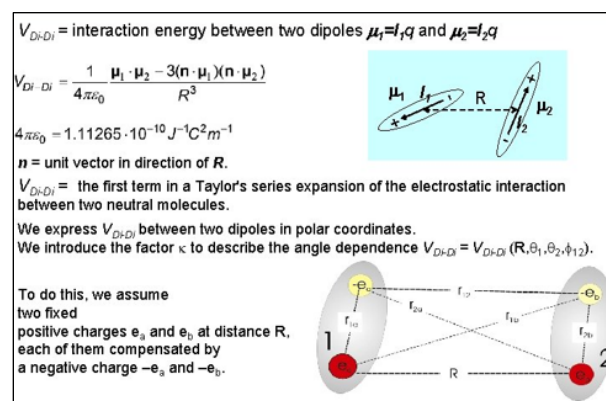


Figure 3. Förster description of the dipolar nature of the energy transfer at near Donor-Acceptor separations.

The rate of the energy transfer can be followed through the appearance of the fluorescence band of the acceptor chromophore. The distance between the two chromophores at which the FRET efficiency reaches  $\frac{1}{2}$  (i.e. 50 %) is called the **Förster Radios**. This distance is specific for each couple of interacting chromophores and is in the range of **20 ...60 Å** (2 ... 6 nm). It should be noticed that. having the dependance of the energy transfer rate on the inverse of the sixth power of the separating distance provides high sensitivity of measurement of the distance.

**FRET** is applied in **fluorescence microscopy** as well as in **molecular biology**. It is useful in the study of molecular dynamics, e.g. **protein-protein**, **protein-DNA** interactions, and **biopolymer conformational changes**. In such

cases one of the two molecules is labeled with a donor and the other with an acceptor chromophore. The mode of measurement might be either through sensitized emission of the acceptor or through the study of the donor chromophore bleaching.

In the recent decades **FRET** has been widely applied in the fields of proteins and *membrane physics*, in the study of, *signaling pathways of metabolism, protein and DNA folding kinetics and in the field of nanoparticle formation*.

A practical school example of FRET experiment is viewed in the energy transfer of cyan fluorescent protein (CFP) dimer (Fig. 4).

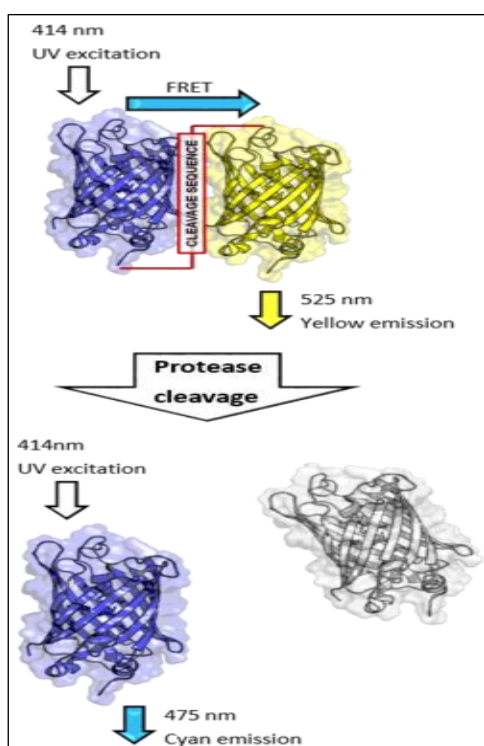


Figure 4. Irradiation of a complex (dimer) yellow CFP, with the donor absorbance band at 414 nm causes emission at 525 nm of YFP. Cleaving the complex by **protease**, only CFP emission band at 475 nm is observed.

Source: Förster T (1948). "Zwischenmolekulare Energiewanderung und Fluoreszenz" [Intermolecular energy migration and fluorescence]. *Annalen der Physik* (in German). 437 (1–2): 55–75.

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## LIQUID CRYSTALS

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**Abstract:** This text presents the underlying physics of liquid crystals, their principal classification, their role in optical displays and other applications.

### 1. Introduction.

Solid crystals such as diamond, Fig.1, break the continuous space-translational symmetry, because not every location is equivalent as some locations are occupied with atoms / molecules of the crystal material and others are without them. However, because of the periodic nature of these locations these crystals have a discrete periodic space-translational symmetry. The atoms / molecules of these crystals are in equilibrium and stable in their ground state.

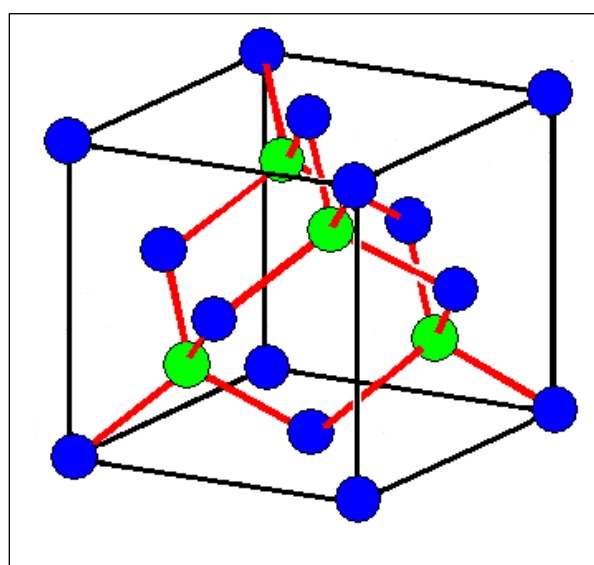


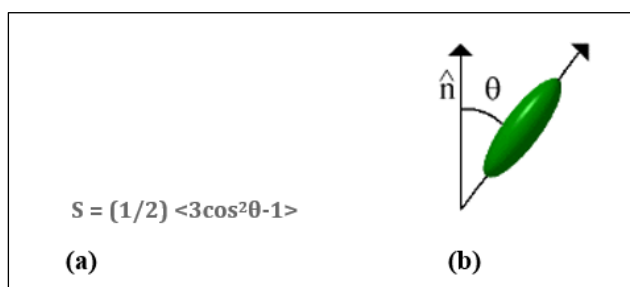
Fig. 1. diamond crystal's stabilized basic structure (1).

Liquid crystal (LC) was discovered in 1888 by the Austrian botanist named Friedrich Reinitzer. The existence of liquid crystal represents as new phase of “soft matter”. Unlike the liquids, where the atoms/ molecules directions have an isotropic distribution in the volume, the atoms / molecules of a liquid crystal are oriented along certain directions.

## 2. Liquid crystals and the order parameter

(2). There are three types of liquid crystals: nematic, smectic and cholesteric. In the liquid crystal phase, the **vector n** about which the atoms/ molecules are preferentially oriented is known as the **local director**. The long axis of the atoms / molecules will tend to align in this direction.

To quantify just how much order is present in the material, an order **parameter S** is defined in Fig. 2 (a):

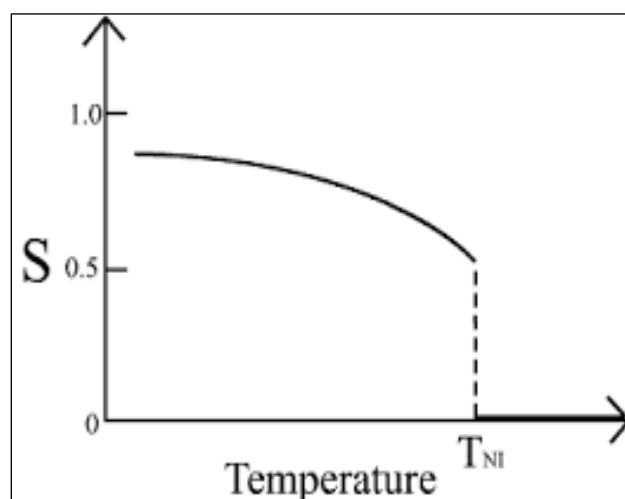


**Fig. 2. (a) and (b).**

Here  $\theta$  is the angle between the local director  $\hat{n}$  and the long axis of each atom/ molecule (Fig. 2 (b)). The brackets denote an average of all the atoms/ molecules in the sample. For an isotropic liquid the average value of the cosine term is such that the bracketed term goes to zero leading to  $S = 0$ . For a solid crystal the  $S = 1$  as the average value of the cosine term is  $=1$ . The values of  $S$  for liquid crystals vary between 0.3 and 0.9, and the  $S = 0$  to 0.3 represents liquids.

Apart from the atom/ molecule alignment as in a solid crystal, the contents of liquid crystals behave like a liquid leading them to be called liquid crystals. Moreover, the  $S$  values of liquid crystals depend on their temperature. Fig. 3, shows the variation of the order parameter  $S$  as a function of temperature for a nematic liquid crystal. When the  $S$  decreases to  $S=0.3$  and

below, the liquid crystal goes over to a liquid phase.



**Fig. 3.** the temperature dependance of the order parameter  $S$  for a nematic liquid crystal. When the  $S$  decreases to  $S=0.3$ , the liquid crystal goes over to liquid phase.

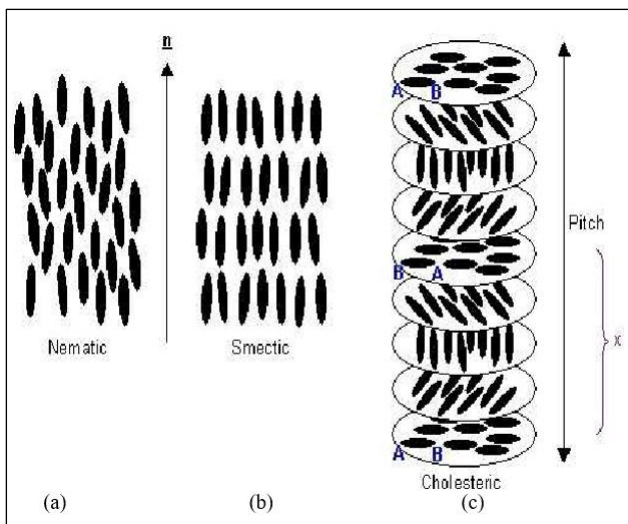
## 3. Classification of different liquid crystals

### i. Nematic liquid crystals.

Fig.4 (a) shows that for a nematic liquid crystal the atoms/ molecules point vertically but are not arranged in a particular order. As the temperature of a nematic liquid crystal is raised, the value of the order parameter  $S$  decreases and finally, there is a transition to the phase of an isotropic liquid. The chiral nematic liquid crystals can selectively reflect one component of the circularly polarized light.

### ii. Smectic liquid crystals.

Fig. 4 (b) shows the structure of a smectic liquid crystal. The atoms/ molecules of this structure show a degree of translational order which is not present in the nematic phase. In the smectic state the atoms / molecules maintain the general orientational order of a Nematic, but also tend to align themselves in layers or planes. Here, the motion is restricted to within these planes, and separate planes are observed to flow past each other. The increased order implies that the smectic state is more “solid-like” than the nematic state.



**Fig. 4.** different types of liquid crystals (1).

### iii. Cholesteric liquid crystals.

Fig. 4 (c) presents the structure of a cholesteric liquid crystal also known as chiral nematic phase. It is characterized by the atoms/molecules being aligned at a slight angle to one another and stacked within very thin layers. This liquid crystal is the last phase before a substance becomes crystalline or solid. Moreover, it has a characteristic of changing color when it is exposed to different temperatures. For this reason, this type of crystal is used in common household items such as thermometers and mood rings (3).

### 4. Liquid-crystal display.

Due to their suitable optical properties and their sensitivity to electromagnetic field, the liquid crystals are extensively used for optical displays. In practice, a liquid crystal cell is placed between two layers of photoconductors. Light is applied to the photoconductor which increases the material's conductivity. This causes the electric field to develop in the liquid crystal corresponding to the intensity of light. The electric pattern can be transmitted by an electric electrode which enables the image to be recorded. Fig. 5, presents a digital watch with the liquid crystal display.



**Fig. 5.** A Casio Alarm Chrono digital watch with liquid crystal display (LCD). It displays a small number of individual digits or fixed symbols as in digital watches and pocket calculators (1).

### 5. Other liquid crystal applications.

They are used for nondestructive mechanical testing of material under stress; to visualize the RF (radiofrequency) waves in waveguides; in material application, where, for example, transient pressure transmitted by a walking foot on the ground is measured; for applications in erasable optical discs; for full color “electronic slides”; for computer-aided drawing (CAD) and light moderators for color electronic imaging (2).

The range of applications of liquid crystals is getting larger and richer with time.

### References

1. Courtesy “Wikipedia”.
2. Introduction to liquid crystals/hem, “Courtesy Wikipedia”.
3. Types of liquid crystals/Sciencing, “Courtesy Wikipedia”.



## THE ROLE OF EDUCATION IN THE PROTECTION OF THE ENVIRONMENT

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The United Nations Conference on the Human Environment, Stockholm, 1972, urged "the organizations of the United Nations, especially UNESCO and other international agencies... to take the necessary steps to establish an international program in environmental education, interdisciplinary in approach, in-school and out-of-school, encompassing all levels of education and directed towards the general public, in particular the ordinary citizen...".

In response to this recommendation, UNESCO and the then newly formed United Nations Environment Program (UNEP), jointly launched in 1975 the International Environmental Education Program (IEEP).

With the aim of contributing, through the most basic tool of education, to the protection of the environment, everything had to be done from scratch, as it were. A conceptual framework had to be formulated. An innovative pedagogical methodology and modality of action had to be developed.

Two international meetings gave impetus to IEEP and provided it with a blueprint for action. The Belgrade Workshop of 1975 and the Tbilisi Intergovernmental Conference on Environmental Education of 1977 which issued the Tbilisi Declaration and Recommendations which provided a framework of principles, objectives and strategies for development of environmental education globally. The International Congress on Environmental

Education and Training (Moscow 1987) provided guidelines for action in the form of the International Strategy for Action in the field of Environmental Education and Training for the 1990s. These principles and guidelines are still valid today in their purpose and scope.

Earth, our natural capital, is at risk. It has been extensively subjected to percent of "Ecological Debt" by the Greed of the industrial countries. Twenty-five percent of the world population living in the industrialized countries are exploiting 80% of the earth system resources. Countries-developing and developed-must now reconcile economic and social development with long-term preservation of the natural resources. Sustainable development must be the mode of action of every society. Otherwise, our natural capital depletion will become irreversible, and our ecological system will become chaos. As a result, our planet may become uninhabitable.

Devising an educational process with both environmental concerns and development means facing two challenges: On the one hand, to conceive pedagogical approaches and a new structuring of the educational process which consolidates the interwoven needs of development and problems of the environment under the theme of sustainable development. On the other hand, to augment the educational process targeted at two groups, citizens and partners in the socio-economic life of a society.

The first concerns the training of scientific and technical personnel and the other concerns the active participation of citizens. In this view, pedagogical innovations and institutional changes become a priority. Much of the failure of current strategies is a consequence of educational management practices which lead to increasing isolation by education processes from the local environment and needs of society.

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# EARTH PONDS AND HAFEERS AS A WATER SOURCE FOR ANIMAL WATERING: A POINT OF VIEW

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## 1. Introduction

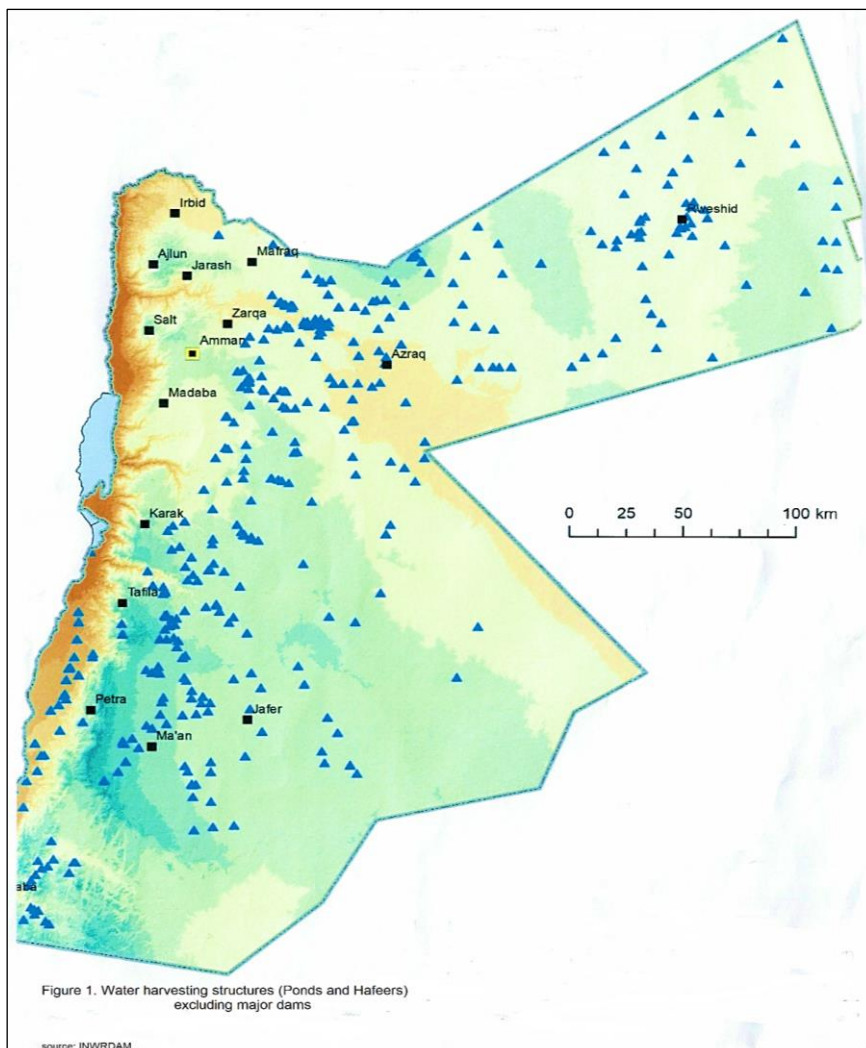
The arid and semiarid climate in Jordan contributed to water scarcity in Jordan. 80% of Jordan area receives less than 100mm/ year<sup>(5)</sup>.

Jordan need of water for its domestic and various economic activities exceeds its renewable

supply<sup>(6)</sup>. The deficit is met by overexploitation of ground water, treated wastewater and by low scale reverse osmosis desalination.

Water harvesting may provide another alternative option to play a role in the water balance in Jordan. In the arid Badia of Jordan surface run-off occurs at low rainfall intensity due to presence of silty surface crust sealing the soil and hampering ground water recharge. The quantity of the run-off water depends on the amount and intensity of rainfall, climate, vegetation and topographical characteristics of the area.

It may vary from 20% - to 60% of total rainfall in arid areas<sup>(9)</sup> <sup>(10)</sup>. Jordan realized the importance of harvesting water in the Badia as a source of water to satisfy the needs of people in the area. There are a total of 520 earth ponds and hafeers with total capacity 128.2 MCM in the Badia of Jordan (figure1).



## 2. Methodology:

In 1990 the Higher Council for Science and Technology in cooperation with the Ministry of water and army corps of engineering implemented 15 hafeers in the grazing areas of the northern Badia. Since the hafeers vary in their shapes, areas and depth their water holding capacity varies significantly, (Table 5). They are designed mostly in rectangular or circular shapes. A smaller precipitation ponds (3-4) m deep are dugout in front of the hafeers to filter out most of sediments before water reaches the hafeer. The precipitation ponds were found to accumulate 1m sediments in 3 years (HSCT Report 1993). Sedimentation in the studied hafeers were estimated based on finding of Al-Ansari et al 2012<sup>(8)</sup> who reported 1679 m<sup>3</sup>/year accumulation in Al-Beqawiya hafeer. This equates to 0.186 m<sup>3</sup>/m<sup>2</sup>/year. Since Al-Beqawiya is located in the northern Badia as is the studied hafeers, sedimentation was expected to reach 1m in each of the studied hafeers in 5 years time.

Water loss to evaporation was calculated for each of the 17 hafeers using the Engineering Toolbox formula for evaporation rate of water as follows:

$$gh = \theta A (X_s - X)$$

gh = amount of evaporated water per hour (kg/h)

$\theta = (25 + 19V) =$  Evaporation coefficient (kg/m<sup>2</sup> hr)

V = Velocity of air (meter/ second m/s)

A = Water surface area (m<sup>2</sup>)

X<sub>s</sub> = Humidity ratio in saturated air (kg H<sub>2</sub>O / kg dry air)

X = Humidity ratio in the air (kg/ kg)

The area of individual hafeers was calculated from their dimensions reported by HCST (HCST report 1993).

The monthly wind speed (knots), relative humidity and air temperature were kindly provided by Jordanian Meteorological Department for the years 2023 and 2024 (Table 1). Wind speed in m/s was calculated by multiplying 0.514444 with the speed in knots (Table 2). Average temperature during the wet and dry season was calculated from the monthly air temperature during the year.

**Table (1) Average wind speed, relative humidity and temperature for the Northern Badia.**

Season	Average wind speed (Knot)	Average Relative Humidity (%)	Average Air Temperature (C°)
Wet season	7.87	52.2	16.95
Dry season (first 3 months)	9.13	32.4	27.6

*Source: Jordan Meteorological Department.*

**Table (2) Average wind speed in the wet and dry seasons in the Northern Badia.**

Seasons	Average (knots)	Wind speed (m/s)
Wet	7.87	4.01
Dry	9.13	4.7

The average maximum saturation humidity ratio of air (X<sub>s</sub>) and the average humidity ratio of air (X) (Table 3) were determined at the average temperature for both wet and dry season in the northern Badia from the tabulated or plotted data posted on the engineering toolbox.com (Table 4, figure2).

Drinking water requirement of small ruminants (goats and sheep) in semi arid locations is reported to be 3L/ animal / day (Gherm 2010)<sup>(4)</sup> or 2.7 – 3.14 L for animal (Jaelyn Whaley 2024)<sup>(7)</sup>.

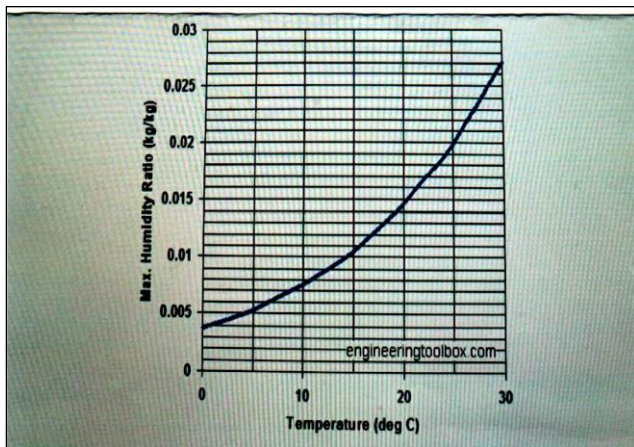
For drinking requirement of the small ruminant population in northern Badia our calculation was based on 2.7 L in the wet season and 3.14 L in dry season.

**Table (3) Average maximum saturation humidity ratio and the average humidity ratio at the average temperature during the wet and dry seasons in Northern Badia.**

Season	Average max-humid. Ratio (x <sub>s</sub> )	Average humid. Ratio (x)	Difference
Wet	0.01215482	0.011849	0.00031
Dry	0.03092048	0.024132	0.0068

**Table (4) Maximum saturation humidity ratio at some common temperatures (kg/kg) in the Northern Badia.**

Temperature	Water Vapor Saturation Pressure (Pa)	Maximum Saturation Humidity Ratio -X- (kg <sub>w</sub> /kg <sub>a</sub> )
0	609.9	0.003767
5	870	0.005387
10	1225	0.007612
15	1701	0.01062
20	2333	0.014659
25	3130	0.019826
30	4234	0.027125



**Figure (2): Maximum humidity ratio (kg/kg).**

### 3. Results and discussion

The capacity of individual hafeers and the available water when completely filled less than the expected sediments; the rate of evaporation and water loss to evaporation during the wet and dry seasons is calculated (Table 5). It had been found that the loss to evaporation was minimum and reached 6% during the wet season, while it reaches up to 76% during the dry season. Water in Dair Al-Quin, Al-Jobieh, Abu Al-Firth and Um Al-Qutain hafeer seemed to overlap across the wet and dry seasons while all remaining hafeers dried up during the dry season.

The rate of evaporation varies among hafeers due to their different areas exposed to the elements. Given the same wind velocity and

prevailing humidity ratio of the air at the prevailing temperature, the larger the area of the hafeer, the more evaporation rate. Thus it is obvious that the deep hafeer with smaller exposed surface area are less subjected to evaporation and thus can retain water for longer time than those with larger surface area and less depth.

The total water loss to evaporation from all hafeers in wet and dry seasons amount to 82% of the total harvested water (6% during the wet season and 76% during the dry season). Since most of harvested water is lost to evaporation, and a large sloping catchment areas (more than 1000m<sup>2</sup>) are needed to fill these hafeers; the sloping catchment areas will be more prone to soil erosion. It may be wiser to construct many smaller cisterns or wells that need smaller catchment areas to hold some of the run-off water. At the same time construct a series of ridges made of elevated soil or stones in the shape of elongated crescent on the sloping catchment area to harvest water in a microcatchment sites (25m<sup>2</sup>). These structures can be effective in supporting suitable plant water requirements such as Atriplex sp. or even barley. To enhance infiltration into soil profile in the microcatchment areas, it is recommended to add organic manure or spray with liquid clay nanoparticles. Opting to this practice will prevent soil erosion that take place in the large slopy catchment areas, prevent flush floods, enhance biodiversity, and provide feed for animals. Devoting the volume of water, that is lost to evaporation from the existing hafeers structures, to grow plants is expected to have a significant socioecmic impact on local farmers. This argument is supported by the findings of Beede 2012<sup>(3)</sup>, and Schlink 2010<sup>(12)</sup> who reported that 86% of water used in livestock production is used to irrigate feed crops and only 12.5% is consumed in servicing and processing.

**Table( 5) Hafeers in the Northern Badia: Capacity, Evaporation rate, loss to Evaporation\*.**  
**\*Sedimentation was calculated according to finding of Nadhir AL-Ansari 2012 for AL-Baqawiya**

المنطقة	Area m <sup>2</sup>	Capacity m <sup>3</sup>	*Available water (capacity less sedimentat ion)	Evaporatio n rate In the wet season m <sup>3</sup> /day	Loss in the wet season m <sup>3</sup>	Evaporation rate in the dry season m <sup>3</sup> /day	Loss in the dry season m <sup>3</sup>	Expected month when dried up
مناة راجل	2500	5000	2500	1.882134	399.012	46.6344	2100.987	15-Jun
الجدعاء	160.14	480	319.86	0.120562	25.559	2.987213	294.301	7-Aug
دير القن (1)	1750	8750	7000	1.3174938	279.309	32.64408	4994.544	22-Nov
دير الكهف (1)	1120	3360	2240	0.843196	178.758	20.89221	2061.242	7-Aug
تل الرماح	200.96	301.44	100.48	0.1512935	32.074	3.74866	68.406	18-May
دير القن (2)	125.6	270.26	144.66	0.0945584	20.046	2.342912	124.614	22-Jun
دير الكهف (2)	100.48	401.92	301.44	0.0756467	16.037	1.87433	285.403	30-Aug
الجبيه	59.97	299.81	239.84	0.0451486	9.572	1.118666	171.156	22-Nov
ارتبيه النعيمات	1225	3675	2450	0.9222457	195.516	22.85086	2254.484	7-Aug
الرفاعيات	123	386.22	263.22	0.092601	19.631	2.294412	243.589	14-Aug
قاسم	300	1050	750	0.2258561	47.881	5.596128	702.119	3-Sep
الثلاج	30.25	90.75	60.5	0.0227738	4.828	0.564276	55.672	7-Aug
المنيصه	140.0	210	70	0.1053995	22.345	2.611526	47.655	18-May
منشيه القنو	135	500						
	تقريبا	تقريبا	365	0.1016352	21.547	2.518258	343.453	13-Sep
أبو الفرث	178.98	805.41	626.43	0.1347457	28.566	3.33865	510.813	25-Oct
المكيفته	200.96	803.84	602.88	0.1512935	32.074	3.74866	570.806	30-Aug
ام القطين	3300	16500	13200	2.4844169	526.696	61.55741	9418.283	22-Nov
المجموع			<b>31234.31 (100%)</b>		<b>1859.452 (5.95%)</b>		<b>24247.527 (77.63%)</b>	

hafeer in the Northern Badia on condition that maintenance is regularly performed every 5 years.

The water used for animal consumption is very small as compared to that used in crop production. More support to this argument comes from the study of Al khaza'leh et al 2020<sup>(1)</sup> who found that only 18% and 39% of the herdsmen in the northern Badia adopting the transhumant system use the rain-harvested ponds to water their animals in the dry and wet seasons respectively. Farmers adopting the sedentary system of rearing showed negligible interest in using these hafeers, since most of them use underground water, tap water or both (Table 6).

**Table (6) Percentage of utilizing different water resources during the wet and dry season in the Northern Badia.**

Production system	Ground water (G); Piped water (P)		Rain-harvested ponds	
	Seasons		Seasons	
	Dry	Wet	Dry	Wet
<b>Transhumant</b>	77% (G)	55% (G)	18%	39%
<b>Sedentary</b>	50% (G)	67 (P)	Negligible	

It seems that these hafeers doesn't play the desired role in responding to the real needs of the ruminant population in the northern Badia. The need for watering of total ruminant animals in the northern Badia amounting to 139735 animals (Table 7) is estimated to be 147,121 M<sup>3</sup>/year which is far more than what is available in these hafeers after evaporation (Table 8, Table 9).

**Table (7) Number of sheep and goats in the Northern Badia (2017).**

Type	No.
Sheep	122845
Goat	16890
<b>Total</b>	<b>139735</b>

\*Source: Agricultural survey, Department of Statistics.

**Table (8) Drinking water requirement of the small ruminant population (goats and sheep) in the northern Badia of Jordan in the wet (Oct-Apr) and dry (May-Sept) seasons.**

Animal SP	# of animals	Water requirement M <sup>3</sup> /season		Total (M <sup>3</sup> )
		Wet season (212 d)	Dry season (153 d)	
Goat	16,896	9,671	8,117	17,788
sheep	122,845	70,316	59,017	129,333
<b>Total</b>	<b>139,741</b>	<b>79,987</b>	<b>67,134</b>	<b>147,121</b>

**Table (9) Remaining available water for animal consumption after the wet and the dry seasons evaporation and small ruminant population water requirement.**

Available harvested water (M <sup>3</sup> )	Loss in the wet and the dry seasons (M <sup>3</sup> )	Available water after evaporation (M <sup>3</sup> )	Ruminant needs in both seasons (M <sup>3</sup> )
31234.31	26106.979	5127.331	147121

#### 4. Recommendations:

Since most of the water harvested in hafeers is seemingly lost to evaporation during the dry season, it is recommended to harvest water in underground cisterns or wells with closed opening. This will reduce the drowning risk and prevent pollution that will deleteriously impact the production of milk and meat of animals <sup>(11)</sup> and may cause water-transmitted disease if it is used for human consumption.

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# ENHANCING WASTEWATER DEPOLLUTION: SUSTAINABLE BIOSORPTION USING CHEMICALLY MODIFIED CHITOSAN DERIVATIVES FOR EFFICIENT REMOVAL OF HEAVY METALS AND DYES\*

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## Abstract

Driven by concerns over polluted industrial wastewater, particularly heavy metals and dyes, this study explores biosorption using chemically cross-link chitosan derivatives as a sustainable and cost-effective depollution method. Chitosan cross-linking employs either water-soluble polymers and agents like glutaraldehyde or copolymerization of hydrophilic monomers with a cross-linker. Chemical cross-linking of polymers has emerged as a promising approach to enhance the wet-strength properties of materials. The chitosan thus extracted, as powder or gel, was used to adsorb heavy metals (lead (Pb<sup>2+</sup>) and copper (Cu<sup>2+</sup>)) and dyes (methylene blue (MB) and crystal violet (CV)). Extensive analysis of the physicochemical properties of both the powder and hydrogel adsorbents was conducted using a range of analytical techniques, including Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Brunauer–Emmett–Teller (BET), and scanning electron microscopy (SEM), as well as <sup>1</sup>H and <sup>13</sup>C nuclear magnetic resonance (NMR). To gain a comprehensive understanding of the sorption process, the effect of contact time, pH, concentration, and temperature was investigated. The adsorption capacity of chitosan powder for Cu(II), Pb(II), methylene blue (MB), and crystal violet (CV) was subsequently determined as follows: 99, 75, 98, and 80%, respectively. In addition, the adsorption capacity of chitosan hydrogel for Cu(II), Pb(II), MB, and CV was as follows: 85, 95, 85, and 98%, respectively. The experimental data obtained were analyzed using the Langmuir, Freundlich, and Dubinin–Radushkevich isotherm models. The isotherm study revealed that the adsorption equilibrium is well fitted to the Freundlich isotherm ( $R^2 = 0.998$ ), and the sorption capacity of both chitosan powder and hydrogel was found to be exceptionally high (approximately 98%) with the adsorbent favoring multilayer adsorption. Besides, Dubinin has given an indication that the sorption process was dominated by Van der Waals physical forces at all studied temperatures.

\* Link to the whole publication:

<https://www.mdpi.com/1996-1944/17/11/2724>

## UNLEASHING PAKISTAN'S TRADITIONAL MEDICINE FOR ECONOMIC ADVANCEMENT

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**Introduction:** Embedded within Pakistan's cultural and historical tapestry lies a treasure trove of traditional medicine. Despite its promising economic and health advantages, the promotion and utilization of herbal medicine encounter multifaceted challenges. However, with the global herbal medicine market poised for significant expansion, Pakistan stands at a pivotal juncture to harness its indigenous knowledge and resources for substantial economic gains.

**Proposal:** This concept paper advocates for the establishment of a specialized entity tasked with advocating for the elimination of barriers obstructing the promotion of herbal medicine in Pakistan. This body will spearhead efforts to enact legislation in the National Assembly, fostering an enabling environment for the herbal medicine industry to flourish. Strategic interventions and support could propel Pakistan's herbal medicine sector to generate a minimum of 5 billion US dollars within the next five years.

**Rationale:** The global herbal medicine market is on an exponential growth trajectory, projected to reach a value of 347 billion US dollars by 2029. This burgeoning sector offers vast opportunities for economic growth and job creation. India's successful utilization of its traditional medicine through the AYUSH system, boasting a market value of 18 billion US dollars in 2020, underscores the immense potential of this industry.

### Objectives:

- Advocate for the removal of regulatory barriers hindering the promotion and utilization of herbal medicine.
- Collaborate with the Health Minister and relevant authorities to devise a roadmap for advancing the herbal medicine industry.
- Identify and address challenges faced by stakeholders in the herbal medicine sector.
- Foster collaboration between traditional healers, scientists, and entrepreneurs to drive research, development, and commercialization of herbal products.
- Explore avenues for international collaboration and market access for Pakistani herbal medicine products.

**Conclusion:** Realizing Pakistan's traditional medicine potential for economic development necessitates concerted efforts from all stakeholders. By establishing a dedicated entity to advocate for barrier removal and promote the herbal medicine industry, Pakistan can unlock its full potential in the thriving global market. With adequate support and strategic interventions, the herbal medicine sector stands poised to significantly bolster Pakistan's economy while safeguarding its rich cultural heritage.



## THE EFFECT OF PEST CONTROL METHODS USED IN INTEGRATED PEST CONTROL

*Management on some Aspects of the Life Performance of the Green Peach Aphid (Myzus Persicae (Sulzer) (Homoptera: Aphididae))*

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The results showed that the extracts of *C. inerume* were effective on all biological aspects of insect, a direct correlation was found between extract concentration and mortality rates. The mortality rates of the different nymphal instars 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and the adult in cold water extract increased from 2.87, 2.87, 1.43, 0, and 0 % respectively in the control treatment to 34.92, 32.44, 28.61, 26.44, 24.53 respectively at the concentration 10 mg/ml, while in boiled water extract were 41.90, 38.80, 33.56, 30.11, 26.19% respectively in the same concentration. The developmental period of the immature stages in cold and boiled water extract were 6.50, 7.00 days respectively at concentration 10 mg/ml, compared with 5.75 days in the control treatment. The results showed an inverse relationship between female productivity and extracts concentration. The number of in births in cold and boiled water extract decreased from 21.00 nymph/female in the control treatment to 13.33, 7.67 nymph/ female respectively at concentration 10 mg/ml.

The n-hexane extract was more effective in causing death of the different nymphal instars compared with ethyl acetate and ethanol, the mortality rate of different immature stages were 57.00, 53.86, 49.01, 45.78, 43.35% in n-hexane extract at concentration 10 mg/ml compared with 4.31%, 4.31%, 4.31%, 4.31%, 2.87% in the control treatment. The developmental period of immature stages in the extract of ethyl acetate

was 8.00 days at concentration of 10 mg/ml compared with 5.75 days in the control treatment, and the female productivity in ethyl acetate extract decreased to 5.00 nymph/ female at concentration 10 mg/ml compared with 18.00 nymph/ female in the control treatment.

The filtrate of *A. niger* was more effective in causing death of the different nymphal instars compared with *A. parasiticus*, where the mortality rate of different immature stages in *A. niger* 44.99%, 41.91%, 38.36%, 35.07%, 34.72% respectively at concentration of 75% compared with 2.87%, 2.87%, 1.44%, 1.44%, 0.0% in the control treatment. The development of period of immature stages was 8.75 days in concentration of 75% *A. niger* compared with 5.75 days in the control treatment, and the productivity decreased to 4.00 nymph/ female in concentration of 75% *A. parasiticus* compared to 21.00 nymph/ female in the control treatment.

The Chess insecticide was more effective in causing death of the different nymphal instars, the mortality rate of different immature stages were 52.61%, 48.02%, 44.20%, 41.31%, 39.17% respectively at a concentration of 0.2 gm/L compared with 2.87%, 2.87%, 1.44%, 1.44%, 0.0% in the control treatment.

**Keywords:** pest control, integrated pest management, green peaches, isolation of fungi accompanying aphids, diagnosis of fungi accompanying aphids (*Myzus persicae* (Sulzer), (Homoptera: Aphididae)).

### Introduction:

Man's struggle against pests began a long time ago, before the emergence of civilization, and that struggle continues to this day and will undoubtedly continue in the future because they both want the same things that the other wants, and if man believes that he is the master of nature, he often forgets the primacy of insects in sovereignty and possession. Nature before the appearance of humanity on Earth by many centuries [2,4,7].

Among these insects is the green peach aphid, *M. persicae*, which is an important species in the Middle East, especially in Iraq. This insect was recorded for the first time in Iraq on peaches in May 1942 [2, 4, 7, 13, 14]. It has a wide range. It has a very wide family of more than (400) plant

families, belonging to (200) genera [2, 4, 7, 13, 20]. This insect transmits a number of viral diseases to its hosts [10, 4, 8, 13, 25]. This insect alone transmits more than 70 types of plant viruses (Shaukat, 1982). This insect also works to obstruct the processes of respiration and transpiration and reduces the process of photosynthesis in the leaves indirectly by absorbing the plant juices and emptying the honeydew, and this helps to collect dust on them to which types of fungi that are pathogenic to the plants stick [2, 4, 7, 13].

The increasing and indiscriminate use of pesticides since the thirties of the last century has led to environmental problems, and since the green peach aphid has reached the rank of the main pest on a number of agricultural crops, especially plants of the Solanaceae family, the trend has become to adopt an integrated method in combating it within the conditions of protected agriculture and the open field in Iraq, which prompted researchers to think about another concept of control called Integrated Pest Management (IPM), which aims to use the best control methods together to reduce the number of the pest to a level below the critical economic limit, meaning that the pest is not eradicated or completely eliminated in the crop or region. [2,4,7,13,14].

The plant kingdom includes many plants that contain substances that are highly effective or toxic in controlling insect pests, and they are no less toxic than similar manufactured chemical pesticides [12, 4, 7, 13, 19]. The use of plant extracts as pesticides is considered one of the elements of integrated control, due to their rapid decomposition in the environment and their low toxicity to humans and animals [2,4,7,13,14]. These materials are highly specialized in their work, as they affect one type of insect, or a number of them. Moreover, it has not yet caused the appearance of resistance in the insects that were treated with it [13,14], and for this reason researchers began studying the effect of these pesticides extracted from plants on insects.

The extract of the jasmine plant (*Clerodendrum inerme*) is one of these extracts because this plant contains active substances, including terpenoids, which are described as substances that prevent insect feeding and inhibit growth [2, 4, 7, 13, 14].

On the other hand, biological resistance using microorganisms is one of the components of integrated pest management (IPM) programs [2,4,7,13,14]. Among these organisms are fungi, as they are considered one of the most widespread pathogenic organisms towards insects, as there are more than (100,000) species of them in nature, (700) of which have the ability to parasitize insects, and (10) of which have been developed to resist insects [2,4 ,7,13,14]. Among these fungi is *Aspergillus* spp. Because it contains a group of fungal toxins.

Scientific research techniques have resulted in pesticides that are not harmful to the environment and to non-target insects during the last thirty years [25,24,17,23,13], as natural compounds were discovered and other materials were manufactured that can interfere with the growth and development of the target insect [25,24,17, 23,13], and among these pesticides is antifeeding, including Chess, which works to immediately stop the absorption of plant sap by affecting the feeding proboscis [25,24,17,23,13].

## **The theoretical framework of the study:**

### **Objectives Of The Study:**

#### **This Study Seeks To Achieve The Following Objectives**

The lack of studies on the use of more than one control method and comparison between them has prompted the idea of this study, which aims to:

First: The use of cold and boiled water extracts and organic solvents of the jasmine sapphire plant and their effect on some life performance standards of the green peach aphid, including:

- Percentages of mortality of the various nymphal stages of the insect and its adults.
- Female productivity.

Second: The effect of the filtrate of some fungi isolated from insects on life performance standards previous to the insect.

Third: The effect of different concentrations of Chess pesticide on the previous life performance standards of the insect.

### **The Importance of Studying:**

The importance of this study lies in the fact that the pest control methods used in integrated pest control management are influenced by some aspects of the life performance of the green peach aphid.

## **First/Materials And Work Methods:**

### **A- Collecting And Raising Insects:**

Nymphs and adults of the green peach aphid *M. persicae* were collected from fields spread across Babil Governorate from radish and Swiss chard plants on 10/22/2007 by taking infected leaves with instars and adults of the green peach aphid on them and placing them in nylon bags and they were diagnosed based on [24,25, 17,23,13]. With the help of Dr. Hadi Mazal Al-Rubaie / College of Science for Girls / University of Babylon, then they were raised and multiplied in 1 x 1 m panels planted with radish plants in the greenhouses of the College of Agriculture / University of Kufa. They were also raised in the laboratory according to the method [25,24,17,23,13]. In an incubator with a temperature of  $(25 \pm 1)$  C and a relative humidity of  $(65 \pm 5)\%$  for the purpose of obtaining a colony.

### **B- Collecting Plant Samples:**

The leaves of the jasmine plant were collected from home gardens on November 3, 2007, during the flowering stage. The leaves of the plant were dried in laboratory conditions, then ground to obtain a fine powder. The powder was stored in nylon bags in the refrigerator until use. The plant was diagnosed with the help of Dr. Abdul Karim Al-Birmani. /University of Babylon Herbarium.

### **C- Preparation Of Aqueous Extracts:**

To prepare the cold water extract of the jasmine sapphire plant, the Al-Mansour method was adopted [25,24,17,23,13]. The pivot. With some modifications to increase the extraction time to 24 hours, 10 grams of fine powder of dried leaves were taken and placed in a 500 ml beaker containing 200 ml distilled water. Then the contents were mixed using a magnetic stirrer for 10 minutes, then the mixture was left for 24 hours. After covering it, the solution was then filtered through two layers of tulle cloth and then filter paper. He discarded the sediment and took the filtrate and placed it in a centrifuge at a speed of 3000 rpm for 15 minutes to obtain a clear solution. Then he placed the solution in the electric oven at a temperature of 45°C to evaporate the water and obtain Dry raw material: 2 grams of dry raw material were taken and dissolved in 100 ml/distilled water. Thus, the concentration of the resulting solution became 2%, or the equivalent of 20 mg/ml, and from it the concentrations (10,5,2.5) mg/ml were prepared with which the insect was treated in

addition to the distilled water. Which represents the control treatment, which is concentration (0). Prepare the boiling water extract using the previous extraction steps by replacing cold distilled water with boiled water.

The effect of organic solvent extract of the jasmine saffron plant on the life performance parameters of the green peach aphid *M. persicae*. It was carried out as in experiments 3-1-1 and 3-1-2, with the same numbers of insects, their stages, the number of replicates, the same concentrations, and the same previous conditions.

## **First: CULTUR MEDIA**

### **A- Potato Dextrose Agar PDA**

Take (39) grams of ready-made PDA culture medium (produced by Himedia, India) and dissolve it in (1) liter of distilled water in a one-liter glass beaker in a water bath and add the Chloramphenicol antibiotic to it in an amount of 250 mg/liter. Divide the medium into 250-capacity glass beakers. ml at a rate of 150 ml for each beaker and seal its nozzle with cotton plugs, then sterilize with an autoclave at a temperature of (121) C and a pressure of (15) pounds/inch<sup>2</sup> for (20) minutes, then left to cool and stored in the refrigerator until use. It is used for the purpose of isolating and purifying fungi in other subsequent experiments.

### **Results:**

A - The effect of both cold water and boiling water extracts of the jasmine sapphire plant (*C.inerme*) on the life performance parameters of the green peach aphid *M. persicae*.

Effect on the death of different nymphal stages and adults shows the effect of the cold and boiled water extract of the jasmine plant *Clerodendrum inerme* in killing the green peach aphid *M. persicae*. It is clear from the figure that the boiling water extract is superior to the cold water extract through its effect in increasing the insect's death rates. The death rates in the boiling water extract reached 23.96% compared to 20.65% in the cold water extract. The results of the statistical analysis indicated the significance of the differences in the results.

### **Recommendations:**

Separating the secondary chemical compounds in the plant, especially the crude terpene compounds because they are non-polar, and testing their effectiveness in the life performance of the insect.

Conduct a field study and compare its results with laboratory studies to determine the effectiveness of extracts, filtrate, and pesticide.

Testing other insects belonging to different insect orders to determine the degree to which they are affected by these extracts, filtrate, and pesticide.

Conduct physiological and histological studies to determine the effect of these extracts, filtrate, and pesticide on the insect's target tissues.

Study the residual effect of extracts, filtrate, and pesticide to determine the amount of their residue for different periods of time.

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## THE GREATER CUCURBIT FLY, DACUS LONGISTYLUS WIEDEMAN TEPHRITIDAE: DIPTERA

*and how to combat t chemically*

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### Abstract:

The Ecological and Biological performance of big cucumber fly *Dacus longistylus* Wiedeman ,it,s one species that record for first time in Iraq to economic importance compared by second type fly middle sea, on some of Cucurbitaceae plants, the plant were melon *Cucumis melo* , Var. Reticulatus Naud , cucumber *Cucumis sativus*, L. and squash gourd *Cucumis melo* , Var. Flexuoses Naud in autumn season in year 2006 and spring season in year 2007 in different locations the first infestation in gourd field at Al-Dair region in happened ,In the middle of September in autumn season, while the first infestation happened in melon field at Shatt-Alarab region in June in spring season. Adult of insect appeared in the beginning of October in (autumn season Temperature is 31<sup>o</sup> C and Humidity 25-30%) and Its density increased in the middle of November (Temperature is 26 C and Humidity 42%), they disappeared in the beginning of December (Temperature is 15 C and Humidity 45%). Whereas, in the spring season, infestation appeared in June (Temperature is 36<sup>o</sup> C and Humidity 20%) and disappeared in July (Temperature is 34<sup>o</sup> C and Humidity 19%) and found also that the highest density of larvae (11.58 larva/10 fruits) in gourd in autumn season, While the highest density (1.72 larva/10 fruits) in melon in spring season.

It was noticed that feeding preference of the insect is depending on determination of infestation percentage on cucurbit plants, and found that highest infestation recorded on gourd fruit, its average was 83.85 % at different regions of Basrah city in autumn season, while the highest percentage found on melon and cucumber , it was 9.23 and 25.26 % in spring season respectively.

In the Laboratory, the effect of temperature and fruit type on biological performance of insect revealed that the mating process happened at the dark. The highest average of period of peri – Oviposition was 5.6 days on melon at temperature 35°C compared with the lowest average 2 days on melon at temperature 30°C.

It was evident also, that the highest period of Oviposition was 14.41 days at 25°C , while the lowest average was 2.5 days at temperature 35°C, there is no significant difference for the effect of fruit types and the complex between the two factors on the period of Oviposition . The highest period of post – Oviposition was 5.1 days at 25°C on gourd , while the lowest was 1 - 1.2 days on cucumber and gourd respectively at temperature 35°C . noticed that highest average of eggs number was on the gourd at temperature 30°C , which was 94 eggs/female and the lowest average was 25.7 eggs/female on the cucumber at temperature 35°C. After that , the highest average of egg incubation period was 5.5 days on melon at temperature 25°C and the lowest average 2.6 days on gourd at temperature 30°C . After the hatching of eggs , It was noticed that the highest hatching percentage was 69.3 % on gourd at temperature 35°C , and the lowest was 43 % on cucumber at temperature 25°C.

The longer period for larvae was 2.6 days at temperature 25°C and the shortest period 1.4 day at temperature 35 C. The highest average of period for larvae was 2 day on melon and the lowest average was 1.6 day on gourd, no significant effect for complex between larval period and fruit type and complex between larval period and temperature, the highest arrage of complex between temperature and fruit type on melon in 25°C its 2.6 day, The highest percentage of larval survival was 91.45 % on cucumber, while the lowest was 86.65% on melon, no effected of temperature on larval survival percentage.

When temperature was increased, the period of peri-pupation was decreased, which was 4.9 hr at temperature 35°C compared with temperature 25, 30°C, its average were 6.5, 6.1 hr respectively, the highest average of period of peri-pupation period was 6.5 hr on gourd, compared with melon and cucumber, Which were 5.4, 5.5 hr respectively, no effect of temperature and fruit type on pupal survival percentage.

The pupation period was 10.7 days at temperature 25°C compared with shortest period for this stage , its average 8.2 days at temperature 35°C , there is no effect of fruit type on pupation period.

The highest average of access for adult stage was 93.6% at temperature 30°C and the lowest average was 56.6 % at temperature 25°C and the highest average of access of adult stage 19% on gourd and cucumber.

The highest average of female age was 26 days on melon at temperature 25°C, while the lowest average 7.7 days on gourd at temperature 35°C, the male age was decreased to 12 days at temperature 35°C, compared with 16.6 days in 30°C there is no effect of complex of two factors on male age . For that the life cycle was shorter at temperature 35°C, which was 15.8 days, compared with 25, 30°C, its average were 23.3, 17.9 days respectively. The life cycle found on cucumber and gourd , which were 18.7 , 18 days respectively, compared with melon , its average was 20.3 days.

The sex ratio for adult of big cucumber fly was 1:1, it also shown that the effect of fertilization on adult age and eggs number, the average of fertility female age was 20.8 days compared with non- fertility female age, its average was 13.7 days. The eggs number was 69.4 egg/ fertility female, compared with 40.9 egg/ non-fertility female.

Shown result of using the chemical insecticides (Karati- Noril-d and Mesurol) that was the effect on insect control in the field, it reduced low significantly the fly infestation rate after reaching by insecticide 0.57 % with Mesurol reaching compared with 8.8 % of Karati after 7 days of the first spray application, it was found that no significant differences for effect of insecticides on adult stage in the laboratory.

Keywords: Greater cucurbit fly, *Dacus longistylus* Wiedema Tephritidae: (Diptera, egg incubation period, hatching rate, insect diagnosis, numerical density of larvae.

### **Introduction**

Plants of the Cucurbitaceae family are economically important vegetable crops. Their

plants live in tropical and subtropical regions of the world. Most of them are unisexual and monoecious and are grown for their fruits [7,17,15]. Which are consumed either fresh or pickled, such as cucumbers and cucumbers, or used in cooking and making jams [5,3,7]. Its fruits contain many important nutrients such as carbohydrates, proteins, fats, calcium, phosphorus, iron, ascorbic acid, and vitamin A [5, 3, 7, 17, 15].

Watermelon, cucumbers, watermelons, cucumbers, pumpkins, and hazelnuts are grown in Iraq [7, 17, 15] and are grown in Basra Governorate in areas estimated at (7273, 5800, 5072, 495, and 25) dunams each for watermelon, cucumbers, cucumbers, gourds, and hazelnuts, respectively [5, 3, 7, 17, 15].

Plants of the cucurbit family are infected with many pests, causing major economic losses, including the major cucurbit fly, *Dacus longistylus*, which belongs to the Tephritidae family, order Diptera, which infects the fruits, causing them resulting damage either by laying eggs, represented by the shortening and twisting of the fruits, or by feeding its larvae on the pulp of the fruits. In addition to the holes it leaves after it emerges due to hardening, which leads to hardening of the fruits, their weakening, and damage [25].

Its adult insects are characterized by their rapid reproduction and the ability of their incomplete stages to hide in the pulp of fruits and soil to escape their natural enemies, which makes chemical pesticides the ideal solution to combat this pest [5, 3, 7, 17, 15].

Chemical pesticides have an important role in combating agricultural pests and increasing agricultural production (International Organization for Agricultural Development, 1996) by reducing pest damage due to their rapid effectiveness and ease of application [5, 15].

Given the danger of this insect to the plants of the cucurbit family and the lack of biological and environmental studies on it and the contribution to limiting its spread through chemical methods.

## **The Theoretical Framework Of The Study**

Objectives of the study.

This study seeks to achieve the following objectives:

This study, which included the following topics, aimed to:

- Study of the spread and seasonal presence of the insect in the regions of Basra.
- Study the susceptibility of some types of plants of the cucurbit family to insect infection in the field.
- Study the nature of the infestation and the damage caused by the insect.
- The effect of temperature and fruit type on the insect's life.
- Study the effect of chemical pesticides on the life performance of insects in the field and laboratory.

Importance of studying:

The importance of this study lies in the major cucurbit fly, *Dacus longistylus* Wiedeman Tephritidae: Diptera and their chemical control

## **Materials And Working Methods:**

### **Field Study:**

Study of the spread and seasonal presence of the insect in the areas of Basra.

Random samples were collected from fields planted with plants of the cucurbit family, such as watermelon, cucumbers, cucumbers, and cucurbits, from the areas of Al-Thaghr, Al-Qurnah, Medina, Al-Deir, Al-Haritha, Shatt Al-Arab, Al-Zubair, and Al-Suwaib farms in Basra Governorate at different time periods, and the number of larvae and the number of infected fruits was calculated for every 10 Fruits.

### **Numerical Density:**

#### **Number Density Of Adult Insects:**

The numerical density of adult insects in the Qurna region was estimated by planting a field of one dunum and using the local type of watermelon, cucumber, and cucumber, starting from August 2006 until the end of November of the same year for the fall season, while the spring season was from March 2007 until July of the same year. The field was divided into three sectors, and each sector was divided into three experimental units. Each experimental unit was planted with a fruit type, and for the three types separately, with three replicates for each type. Attractive bait traps were used, the modified McPhail trap [5, 3, 7, 17, 15], which is made of A plastic dish with a diameter of 25 cm<sup>2</sup> was placed in the bottom of the molasses as an attractive

food substance. An adhesive was used, which is Trip trap (a transparent, odorless, non-toxic liquid glue substance). It was placed on the edges of the dish to catch the insects that visited the trap. A wire funnel with rough holes was placed at a height of 25 cm. From the surface of the dish so that the top of the funnel is upward, it is connected with a wire at the top and suspended in a wooden stand in the shape of an inverted L at a height of 50 cm, as shown in Figure (1). The numbers of adults that are attracted to it each day were calculated throughout the period of the plant's presence in the field and for the spring and fall seasons. Ten traps for the area distributed on its perimeter and center (Mansour and Taha, 1983). The temperatures and relative humidity recorded at the weather station in Al-Hussein neighborhood, Basra Governorate, were adopted.



Figure 1. Sticky trap.

Numerical density of larvae:

The numerical density of larvae on watermelon, cucumber, and cucumber fruits was calculated in the same field in paragraph (3-1-2-1) in the Qurna region for the spring and fall seasons. The numerical density was estimated on the basis of calculating the number of larvae for every ten infected fruits after dissection, which were collected randomly from The diagonal of each experimental unit was calculated for each fruit type separately and for all sectors of the experiment, and the temperatures and relative humidity mentioned in the previous paragraph were adopted.

Study of the sensitivity of some species of plants of the Cucurbit family to the Cucurbit major fly. I tested the susceptibility of some species of the Cucurbit family in the Qurna region in the field

mentioned in paragraph (3-1-2-1) by calculating the infection rate based on the number of infected fruits for every ten fruits collected randomly from the two regions of each experimental unit and for each fruit type separately on a weekly basis. On external affected areas.

Nature of injury and damage:

This experiment was conducted in the Qurna region in the field planted with watermelon, cucumbers, and cucumbers mentioned above. The fruits of the various plants at all stages of their growth were collected separately in nylon bags and transported to the laboratory for the purpose of examining them and determining the nature of the damage and the stage causing the damage.

Chemical control:

This experiment was conducted in a one-acre watermelon field in the Qurna region in Basra Governorate, and three chemical pesticides were chosen: Karate and Noryl-D at a concentration (0.7 ,0.7)ml/L Misorol 0.7 g/L. The field was divided into sectors with three replicates for each pesticide, and readings were taken by calculating the number of infected fruits for every 20 fruits one day before spraying and after (1, 3, 7, 10). One day after the first spraying and the second, which was conducted one day after the end of the first spraying [5, 3, 7, 17, 15].

**Laboratory Study:**

**Preparing The Permanent Colony:**

Samples of infected watermelon, cucumber, and cucumber fruits were collected from different survey areas in Basra Governorate and placed in three glass boxes with dimensions of 40 x 30 x 30 cm<sup>3</sup> under laboratory conditions with 12 hours of lighting (Hassoun 1988). The bottom of the box was covered with a thin layer of soil 3 cm thick and the top was covered. The box was covered with a soft-touch cloth (malgam), and the cloth was secured with a rubber band. The larvae were left to feed on the fruits until they became impossible, and after the adults emerged, they were fed on a 10% sugar solution [30]. Some pieces of watermelon fruit pulp were added to it in an amount of 100 g/liter of water, then a piece was submerged. of cotton with the sugar solution, provided that it is moistened with the solution daily, while placing the solution in the refrigerator to protect it from rotting and replacing it every two days, and placing

watermelon, cucumber, and cucumber fruits separately in the breeding boxes for the purpose of laying eggs on them by the adults, and replacing the dry fruits with soft fruits for the purpose of constantly renewing the colony in order to obtain Eggs and larvae to be used for subsequent experiments, as the colony was maintained for two generations before experiments were conducted on it.

#### **Method Of Mating And Laying Eggs:**

Males and females raised inside the breeding box and under laboratory conditions were monitored by providing 12 hours of light and 12 hours of darkness [5, 3, 7, 17, 15], for the purpose of monitoring them continuously to determine the time and manner of mating, mating method, and egg laying.

#### **Insect Life Cycle:**

The effect of differences in temperature and type of fruits on the life of insects. I used three temperatures: 25, 30, 35  $\pm$  2°C and relative humidity %70–60 was determined using a moisture meter (Prazision Shygro Multithrra) by placing 30 g of KOH salt in 100 ml of water inside drying containers [15]. Three fruits of vegetable crops (watermelon, cucumber, and cucumber) were placed after the adults laid eggs on them in The permanent farm was carried out separately, then the eggs were left to hatch and develop until they reached the stage of pupation for each type of fruit separately, and after the emergence of the adults, each pair of insects was collected according to the type of fruit on which the larvae were fed, in three replicates in open-ended glass bottles (bell bottle), 9 cm high. Its internal diameter is 7 cm, and the diameter of the nozzle is 5.5 cm<sup>2</sup>. It was covered from above with a piece of mullet cloth and secured with a rubber band. From below, it was placed in a plastic Petri dish.

#### **Results And Recommendations:**

##### **Field study**

Distribution and seasonal presence in the Basra regions.

The results of the field survey of the insect *Dacus longistylus* showed that it was widespread in Basra Governorate during the fall season of 2006 and the spring season of 2007 on plants of the Cucurbit family. The variation in the rate of infection between different regions, as the first infection was recorded on September 16, 2006 in the areas of Al-Deir, on cucumber plants and

cucumbers. Shatt al-Arab on watermelon and cucumbers, as it was found in all regions during October and the second of the same year, with a variation in the infection rate of 10-90% according to the regions. It was not recorded in the Zubair regions, but was recorded in separate regions in June 2007, with an infection rate of 10-20%.

#### **Numerical Density:**

Number density of adult cucurbit flies

The numerical density of *D. longistylus* in the two growing seasons (autumn and spring) for an entire year in a field planted with plants of the cucurbit family. Adult insects began to appear in the first week of October of the same year, and their initial density reached 1 insect for every 10 traps, and the number began to rise. It reached its peak in the second week of November, with an average of 86 insects per 10 traps, an average temperature of 15-20°C, and a relative humidity of 40-45%. After that, the adults disappeared in the field throughout the year. This is attributed to the unsuitable weather conditions of humidity and temperature. The increase in the population density of the insect in an epidemic manner in the fall season, the lack of activity of adults in the field, and its non-appearance in traps in the spring season, despite the similarity in temperature rates for the two seasons, may be due to the high level of relative humidity in the fall season and its decrease in the spring season, as shown in Figure (2).

Hashim and others (2005) confirmed that species of the genus *Dacus* spp increase in activity with increasing rates of humidity and temperature, thus increasing their numerical density, especially in tropical regions. Humidity affects the rate of growth and reproduction in most insects, i.e. it increases to a maximum when it ranges from 60-70%, and at the same time mortality rates decrease.



Figure 2. Side and dorsal view of a male cucurbit fly.



Figure 3. Female Cucurbit major fly.



Figure 4: How a female lays eggs Cucurbit major fly.

## Second / Recommendations:

- Temperature and type of fruits have an effect on the insect's life.
- The fruits of the Cucurbit family are infested with the major cucurbit fly *Dacus longistylus* and *Ceratiatis capitata* in Basra Governorate. *D. longistylus* has been studied for its economic effect on cucurbits.
- The greater cucurbit fly is found in all regions except the Al-Zubair region in the fall season, and is not present in the Al-Thaghr, Al-Jawaber, Al-Alawi, and Al-Deir regions in the spring season in Basra Governorate.
- The numerical density of the insect increases with the level of humidity in the environment, as it increases in the fall season compared to the spring season
- The insect prefers cucumber fruits compared to cucumber and watermelon fruits and affects them by laying eggs, while the effect of the larvae on the fruits is through feeding on the pulp, which leads to their hardening and brown color and the presence of traces of their emergence from them. The sex ratio of the insect was 1: Approximately 1. The male is able to fertilize only one female, and fertilization increases the

lifespan of the female and the number of eggs that the female lays.

- The chemical pesticides (Crate - Mizorol - Noril - D) have an effective effect in reducing the percentage of insect infestation in the field.

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## THE DEPUTY HEAD OF MISSION OF THE EMBASSY OF PAKISTAN VISITS IAS HEADQUARTERS

IAS President, H.E. Dr. Adnan Badran received H.E. Mr. Junaid Sadiq, Deputy Head of Mission/ Councillor, Embassy of the Islamic Republic of Pakistan on Monday 27<sup>th</sup> May 2024 at the IAS headquarters in Amman, Jordan. The visit underscored the growing importance of scientific cooperation between Pakistan and the broader Islamic world.

H. E. Dr. Badran took the opportunity to highlight the academy's relentless efforts in promoting scientific research, innovation, and knowledge-sharing among OIC member states. He also briefed the guest on the Academy's history, Fellows and activities including past and future conferences. He also stressed that the long-lasting exchange of insights and expertise between Pakistan and IAS promises to open new avenues for collaborative research and development initiatives in various scientific disciplines.

H. E. Mr. Sadiq discussed and enquired about issues relating to the 25<sup>th</sup> IAS Conference that is scheduled to be held in Islamabad, Pakistan on 22 July 2024 under the title "Water-Energy-Food-Ecosystem Nexus for the Security of the OIC Countries". He also expressed his appreciation for the visit and hoped there would be more visits and communication between the Embassy of Pakistan and the IAS.



H.E. Dr. Adnan Badran with H.E. Mr. Junaid Sadiq.



Within the framework of its Social Development Capacity Building Programme (SD-CaB) and the Vocational Education and Training Programme for the OIC Member Countries (OIC-VET), SESRIC, in collaboration with the Small and Medium Business Development Agency of the Republic of Azerbaijan (KOBIA), will organise a Workshop on "Empowering MSMEs in OIC Member Countries through Green Climate Finance" on 9-10 July 2024 through an online video conferencing platform.

The workshop aims to promote the use of green climate finance mechanisms to support the growth and sustainability of MSMEs (Micro, Small, and Medium-sized Enterprises) in OIC countries. It will address challenges faced by MSMEs in accessing green finance, share best practices, and identify opportunities for collaboration among stakeholders to enhance support for MSMEs in adopting green practices. Additionally, the workshop aims to raise awareness about sustainable practices among MSMEs and facilitate the development of policies and strategies to promote green entrepreneurship and innovation.

Key topics to be covered in the workshop include:

- Introduction to Green Climate Finance;
- Green Financing Mechanism for MSMEs;
- Platform on Financing SMEs for Sustainability;
- Climate Finance Efficiency for MSMEs;
- Perspectives of Sustainable Finance for MSMEs;
- The Future of Climate Finance: Opportunities for Green MSMEs; and
- Climate Smart Financing for MSMEs

For more information about SESRIC's Social Development Capacity Building Programme (SD-CaB), please visit <https://www.sesric.org/sd-cab.php>.

For Vocational Education and Training Programme for the OIC Member Countries (OIC-VET), please visit: <https://www.oicvet.org/index.php>.

# Discovering PNAS and PNAS Nexus: Exploring Collaborative Opportunities

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## FELLOWS NO LONGER WITH US

### THE LATE PROF. MOHAMMAD SHAMIM JAIRAJPURI (INDIA)



(1942 - 2024)

It is with a sense of sadness and sorrow that the secretariat of the Islamic World Academy of Sciences (IAS) announces the passing away of the eminent scientist and IAS Fellow; **Prof. Mohammad. Shamim Jairajpuri (India).**

Prof. Mohammad. Shamim Jairajpuri was born in 1942. He obtained his B.Sc. (1959), M.Sc. (1961) and Ph. D(1964) from Aligarh Muslim University. The degree of Doctor of Science (D.Sc.) was awarded to him in Zoology by Aligarh Muslim University in 1970 on his outstanding work on Neuratology in particular on Taxonomy, at a young age of 28 years only. He was first appointed a Lecturer (1964) then a Reader (1972), Professor (1983), Chairman (1988-89 & 1997-98) of the Zoology Department and Dean (1993-95 & 1997-98) of the Faculty of Life Sciences, AMU.

Prof. Jairajpuri has done pioneering research on plant and soil nematodes for which the Zoological Survey of India awarded him with gold medal in 1997 and 1998. He was considered a renowned world authority in this subject. He has published over 20 Books and Monographs, over 350 research papers and contributed numerous book chapters and general articles in reputed Journals of the world. He has the distinction of publishing over 80 research papers in *Nematologica* (The Netherlands) and over 40 papers in *Revue de Nematologie* (France), the two top most international journals in the subject of Nematology.

He had traveled widely within India and abroad (USA, UK, Germany, The Netherlands, Belgium, Italy, Australia, Switzerland, Canada, South Korea, Egypt, Pakistan, Bangladesh) in pursuit of his scientific work and has inaugurated and chaired many national and international conferences, seminars, symposia, workshops etc.

Prof. Jairajpuri was Fellow (FNA, FASc, FNASc, FAAS, FISP, FZSI, FZS, FIBOL etc.) of several learned societies of the world. He was the President of the Nematological Society of India (1979 -81), and Chief Editor of the *Indian Journal of Nematology* (1977-79), Vice President of the Zoological Society (1989-91), and Secretary of the Helminthological Society of India (1978-81). He is on the Editorial Board of several national and international journals. He has guided 28 students in their Ph. D and an equal number in M.Phil degrees. He was the Principal Nematologist to the Commonwealth Agricultural Bureau International, United Kingdom from 1981-83. He has held the highly prestigious and coveted position of the Director of Zoological Survey of India from 1989-91 under the Ministry of Environmental and Forests and in that capacity he was advisor to the Government of India on all matters pertaining to Zoology.

In 1991, he was appointed Coordinator of the Agriculture Center at AMU and became the Founder Director of the Institute of Agriculture in 1993 and worked in that capacity until July 1996 and through ceaseless efforts he developed it into an organisation of national status. He was the Dean, Faculty of Life Sciences and also simultaneously Chairman of the Department of Zoology, Museology and Wildlife Sciences. Prof. Jairajpuri was a member of several high-powered committees of the Government of India. Since 9th January 1998 he was working as the Founder Vice Chancellor of the Maulana Azad National Urdu University and simultaneously as the Honorary Professor in School of Life Sciences of the University of Hyderabad.

In December 1999 the Ministry of Environment & Forests chose him to be the first recipient of the Janaki Ammanl National Award in Taxonomy for his work in the field of Nematology. The award carries a cash prize of Rs. 50,000 and citation. He was elected a Fellow of the Islamic Academy of Sciences in 2002.

## ABU MARWAN IBN ZUHR (1091 - 1161)



Abu Marwan Abd al-Malik Ibn Zuhr was born at Seville in 1091/c. 1094 A.D. After completing his education and specializing in medicine, he entered the service of Almoravides (Al-Murabatun), but after their defeat by the Al-Mohades (Al-Muwahadun), he served under 'Abd al-Mu'min, the first Muwahid ruler. He died in Seville in 1161/c. 1162 A.D. As confirmed by George Sarton, he was not a Jew, but an orthodox Muslim.

Ibn Zuhr was one of the greatest physicians and clinicians of the Muslim golden era and has rather been held by some historians of science as the greatest of them. Contrary to the general practice of the Muslim scholars of that era, he confined his work to only one field: medicine. This enabled him to produce works of everlasting fame.

As a physician, he made several discoveries and breakthroughs. He described correctly, for the first time, scabies, the itch mite and may thus be regarded as the first parasitologist. Likewise, he prescribed tracheotomy and direct feeding through the gullet and rectum in the cases where normal feeding was not possible. He also gave clinical

descriptions of mediastinal tumours, intestinal phthisis, inflammation of the middle ear, pericarditis, etc.

His contribution was chiefly contained in the monumental works written by him; out of these, however, only three are extant. *Kitab al-Taisir fi al-Mudawat wa al-Tadbir* (Book of Simplification concerning Therapeutics and Diet), written at the request of Ibn Rushd (Averroes), is the most important work of Ibn Zuhr. It describes several of Ibn Zuhr's original contributions. The book gives in detail pathological conditions, followed by therapy. His *Kitab al-Iqtisad fi Islah al-Anfus wa al-Ajsad* (Book of the Middle Course concerning the Reformation of Souls and the Bodies) gives a summary of diseases, therapeutics and hygiene written specially for the benefit of the layman. Its initial part is a valuable discourse on psychology. *Kitab al-Aghthiya* (Book on Foodstuffs) describes different types of food and drugs and their effects on health.

Ibn Zuhr in his works lays stress on observation and experiment and his contribution greatly influenced the medical science for several centuries both in the East and the West. His books were translated into Latin and Hebrew and remained popular in Europe as late as the advent of the 18th century.



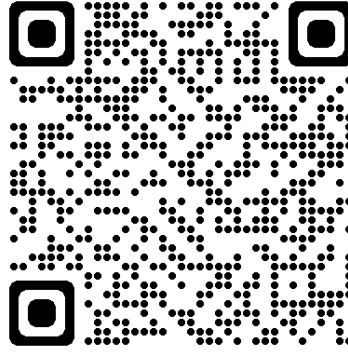
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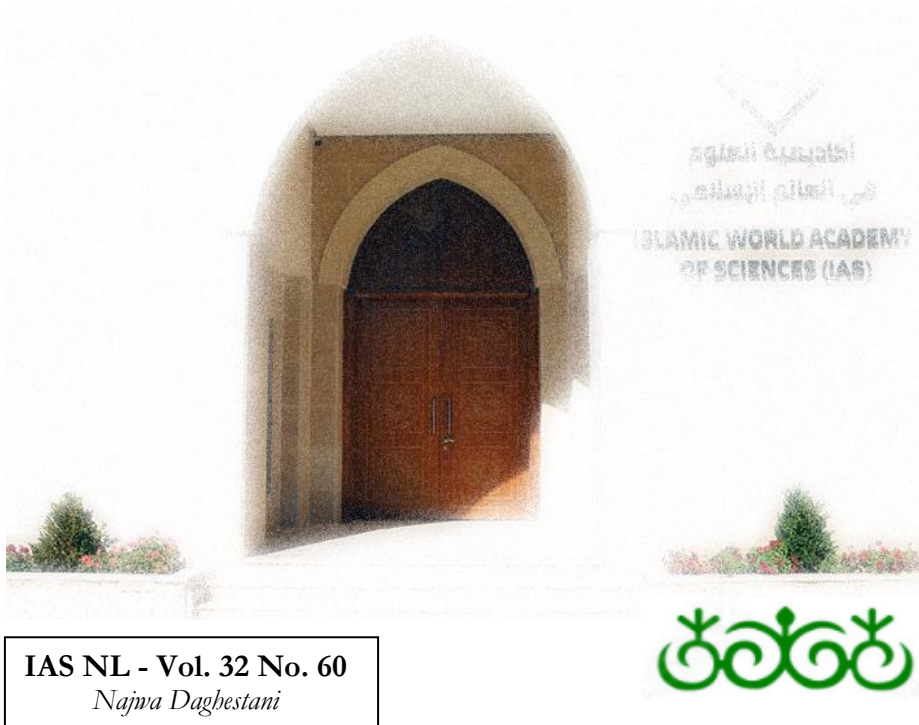
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