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Remarks on the *Vulnerable World Hypothesis Nick Bostrom*

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ABSTRACT

In the past few decades, there is trend of increasing number of new inventions and technologies being introduced to the world. While conventionally, all new technologies are considered as an indicator of human progress, but as Nick Bostrom argues, actually we may think of new inventions as picking balls from an urn. We can find: white balls (good inventions to benefit of mankind), grey balls (inventions which bring some good but also some harms to mankind), and black balls (inventions which may bring the world population into extinction). In this short review, while we agree with Bostrom's arguments, we don't agree on his recipe to create a global surveillance. We discuss a few examples other than what Bostrom points out.

KEYWORDS: Vulnerable World Hypothesis, Nick Bostrom, Inventions, World's Future

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INTRODUCTION

In the past few decades, there is trend of increasing number of new inventions and technologies being introduced to the world. While conventionally, all new technologies are considered as an indicator of human progress, but as Nick Bostrom argues, technology policy should not unquestioningly assume that all technological progress is beneficial, or that complete scientific openness is always best, or that the world has the capacity to manage any potential downside of a technology after it is invented. Instead, actually we may think of new inventions as picking balls from an urn. (Nick, 2019) [1].

He introduces the concept of a vulnerable world: roughly, one in which there is some level of technological development at which civilization almost certainly gets devastated by default, i.e. unless it has exited the 'semi-anarchic default condition'. Several counterfactual historical and speculative future vulnerabilities are analyzed and arranged into a typology. A general ability to *stabilize a vulnerable world* would require greatly amplified capacities for preventive policing and global governance.

Definition of vulnerable world hypothesis

One way of looking at human creativity is as a process of pulling balls out of a giant urn. The balls represent possible ideas, discoveries, technological inventions. Over the course of history, we have extracted a great many balls – mostly white (beneficial) but also various shades of gray (moderately harmful ones and mixed blessings). The cumulative effect on the human condition has so far been overwhelmingly positive, and may be much better still in the future (Bostrom, 2008).

According to Bostrom:
"Let us introduce the hypothesis that the urn of creativity contains at least one black ball. We can

refer to this as the vulnerable world hypothesis (VWH). Intuitively, the hypothesis is that there is some level of technology at which civilization almost certainly gets destroyed unless quite extraordinary and historically unprecedented degrees of preventive policing and/or global governance are implemented.

More precisely:
VWH: If technological development continues then a set of capabilities will at some point be attained that make the devastation of civilization extremely likely, unless civilization sufficiently exits the semianarchic default condition." (Nick, 2019) [1].

Our suggestion: an open public dialogue of tech choices that mankind have. In essence, this paper argues as follows, while we agree with Bostrom on possible pulling out black balls from a giant urn, but *we don't agree* with his suggestion of global surveillance or global governance:

"The vulnerable world hypothesis thus offers a new perspective from which to evaluate the risk-benefit balance of developments towards ubiquitous surveillance or a unipolar world order." (Nick, 2019) [1].

Because we consider that a global surveillance ala Orwell's *1984*, is just another type of black ball, which makes humanity falls into global tyrants. Such an option is unacceptable, because the flourishing of freedom and democracy is a conditio sine qua non for better state of humanity.

Nonetheless, to support our argument, allow us to consider three examples on how progress of mankind in the name of technology advancement should be discussed more openly, not just for the sake of the few global elite's interests.

Three examples

1. Are human minds reducible to Turing machines?
Considering rapid development of technologies, especially computation power, AI, and robotics etc. (see picture), many people ask questions: will all jobs be replaced by machines? Or in other words: is it true that robots, artificial intelligence and automated machines will replace all human work? In essence, this might be reduced to the question: "can the functioning of the human brain be reducible to a Turing machine?" Because in the language of mathematics, a computer is a Turing machine. Our tentative guess: If it can be shown that the human brain/creative function is not the same as a Turing machine, then it means that there are types of human work that exceeds the capacity of even the most sophisticated robots/computers. This means that it will not be replaced. Of course, this is as long as there are no non-Turing computer systems. That's an optimistic view. The alternative: The pessimistic view is that with many new discoveries, in the long term carbon-based humans will be replaced by silicon-based computers, unless they are mutated into transhumans. This is roughly the central thesis in Yuval Harari's book (*Homo Deus*). Then what if this is compared with the theory of creation that humans are in the image of God? Do humans have the ethical right to mutate into transhumans, in order to keep pace with the development of robotics and artificial intelligence? We will discuss these questions from various perspectives, including aspects of technology, computational philosophy as well as theology/ethics.
In our opinion, the argument of Prof. Roger Penrose has been discussed a lot. But what we want to point out is that Turing machines are not designed to be creative. See also ref. [2-5].

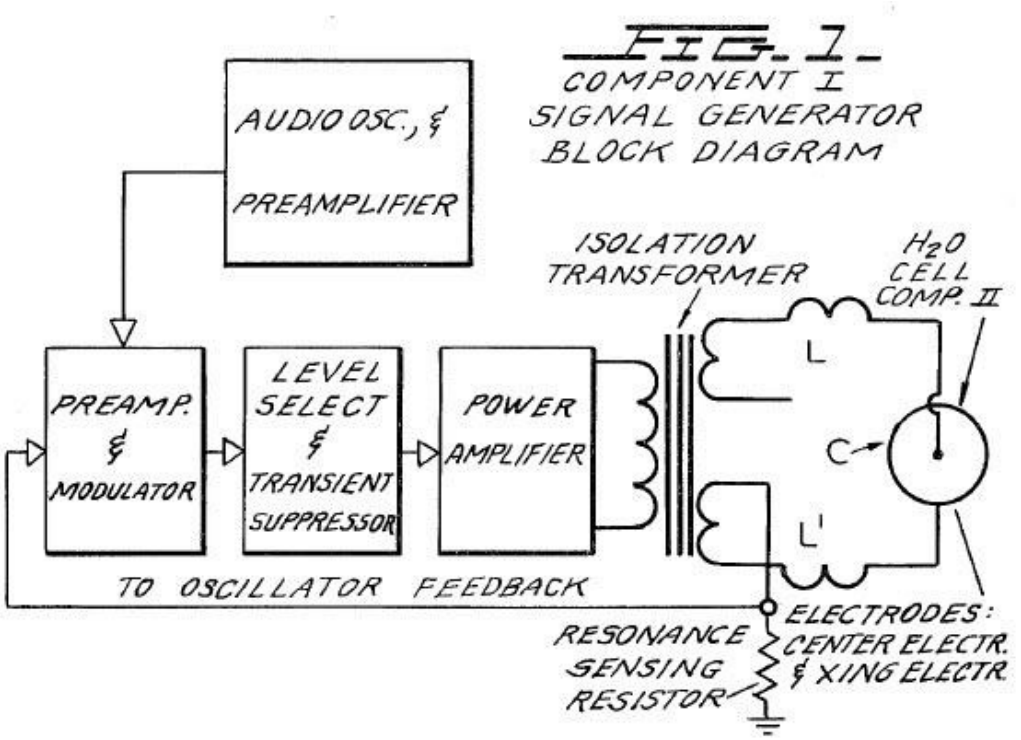
2. Potential uses and effectiveness of ecoenzyme to reduce the adverse effects of 5G radiation
As we know, there are several reports such as from Ronald Kostoff (2020) and others stating that 5G radiation on the order of the GHz frequency will have a negative impact on human health and the environment. The problem is, even though we are concerned, it seems difficult to stop the pace of 5G implementation. What might be done is: we can educate people to start using ecoenzymes in living rooms and rooms to reduce the bad effects of 5G. For instance, we planned a simple experiment by installing about 2 liters - 3 liters

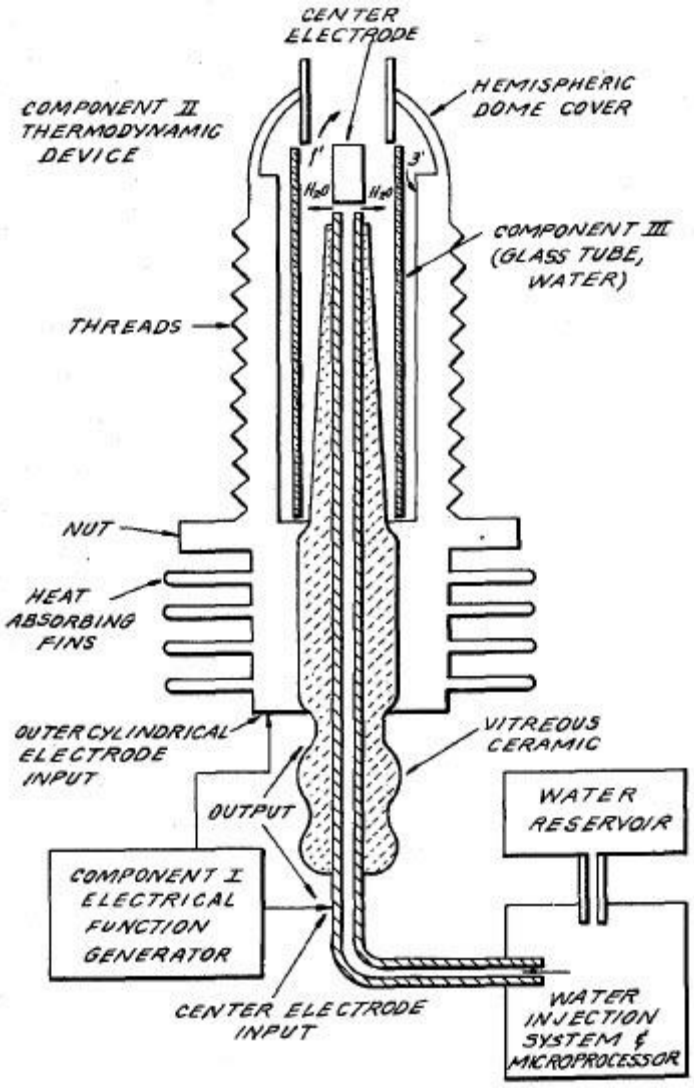
of ecoenzyme (for instance) under the beds or in the middle of the room. Then we will measure for example: the radiation level on the first day, the second day until the seventh day. If it is proven that radiation level to decrease significantly, it means that it is because of the use of ecoenzymes. It is hoped that this will provide measurable clues to the effectiveness of the ecoenzyme in counteracting the adverse effects of 5G radiation.

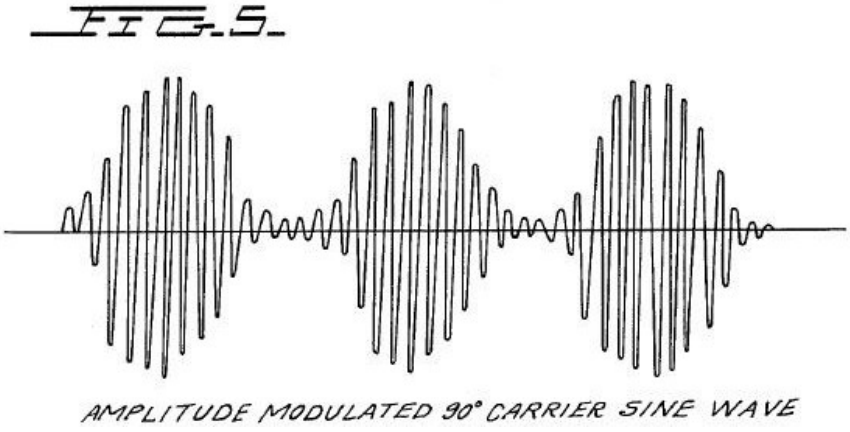
3. Potential use of water as fuel for cars etc, as per inventions by Puharich, Stan Meyer etc.

While most of us may already hear of Stan Meyer's *water-car invention*, what goes unnoticed to general public is that Dr. A. Puharich already obtained patent for invention of water electrolysis just before Meyer went on with his experiments with water as fuel. Given that the method followed by Meyer is very close to Puharich's method, then chance is that Meyer read Puharich's patent file before he started.

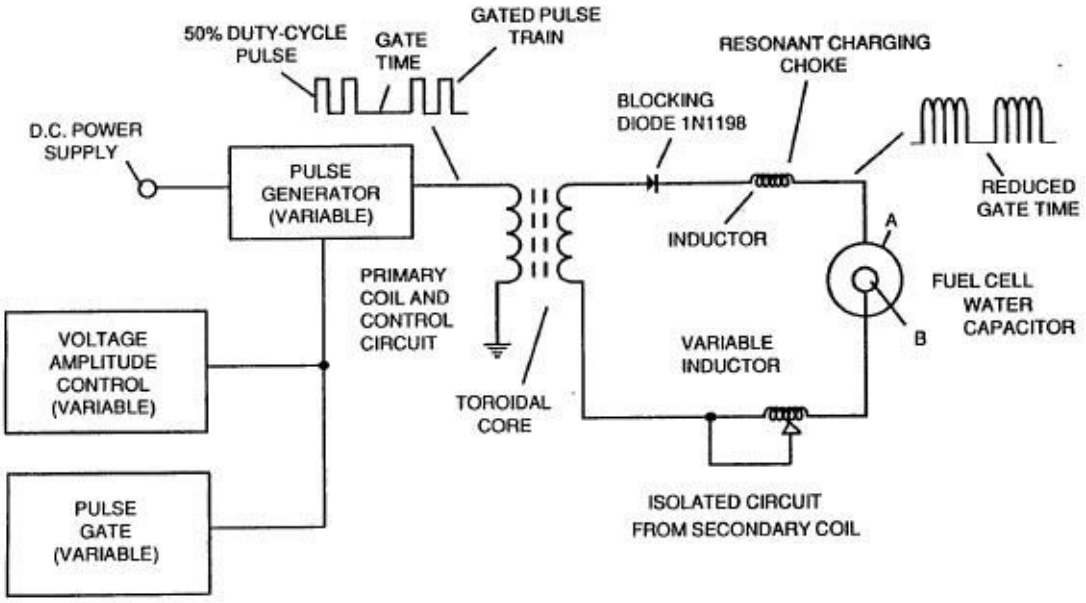
The followings are some diagrams of Puharich's invention of water electrolysis method in comparison with Stan Meyer.

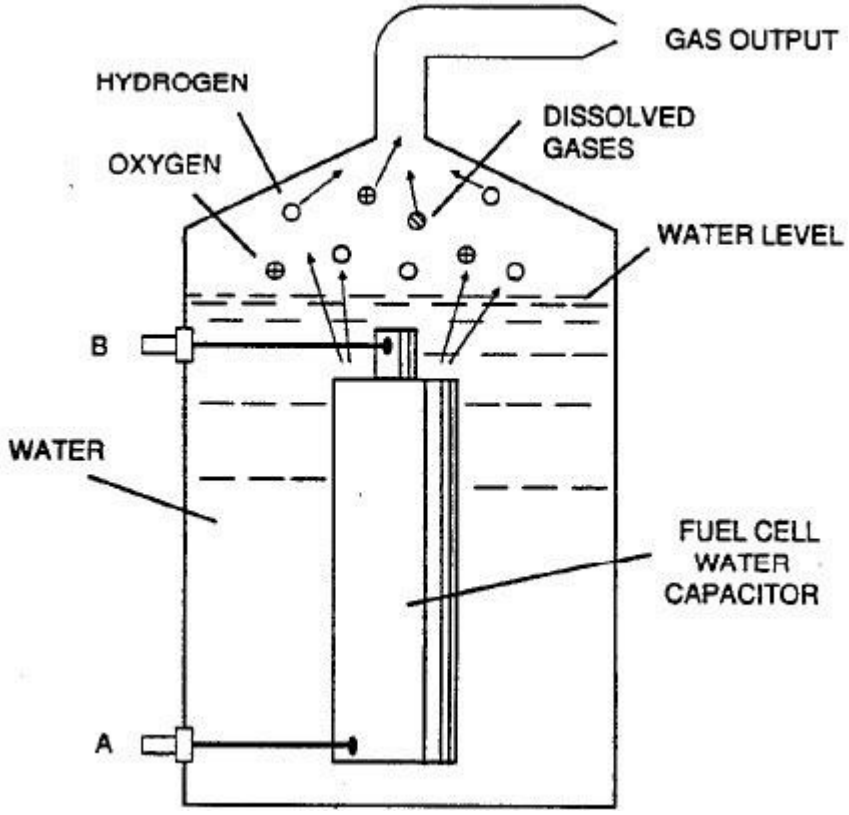






Illustrations 1-3: Puharich's cell and wave-form


50% DUTY-CYCLE PULSE
GATE TIME
GATED PULSE TRAIN
RESONANT CHARGING CHOKE
BLOCKING DIODE 1N1198
D.C. POWER SUPPLY
PULSE GENERATOR (VARIABLE)
REDUCED GATE TIME
INDUCTOR
A
FUEL CELL WATER CAPACITOR
B
PRIMARY COIL AND CONTROL CIRCUIT
VOLTAGE AMPLITUDE CONTROL (VARIABLE)
VARIABLE INDUCTOR
TOROIDAL CORE
PULSE GATE (VARIABLE)
ISOLATED CIRCUIT FROM SECONDARY COIL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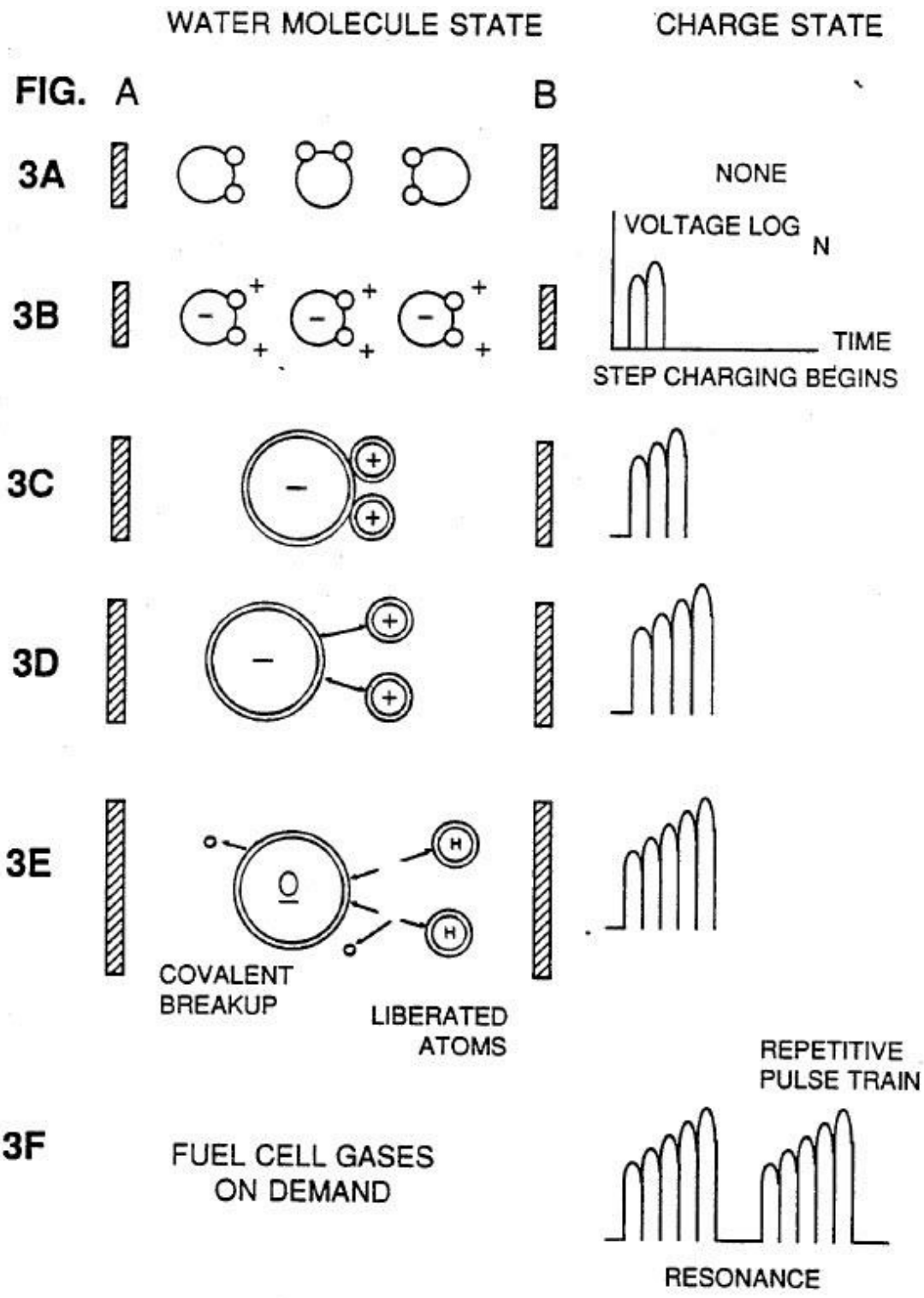
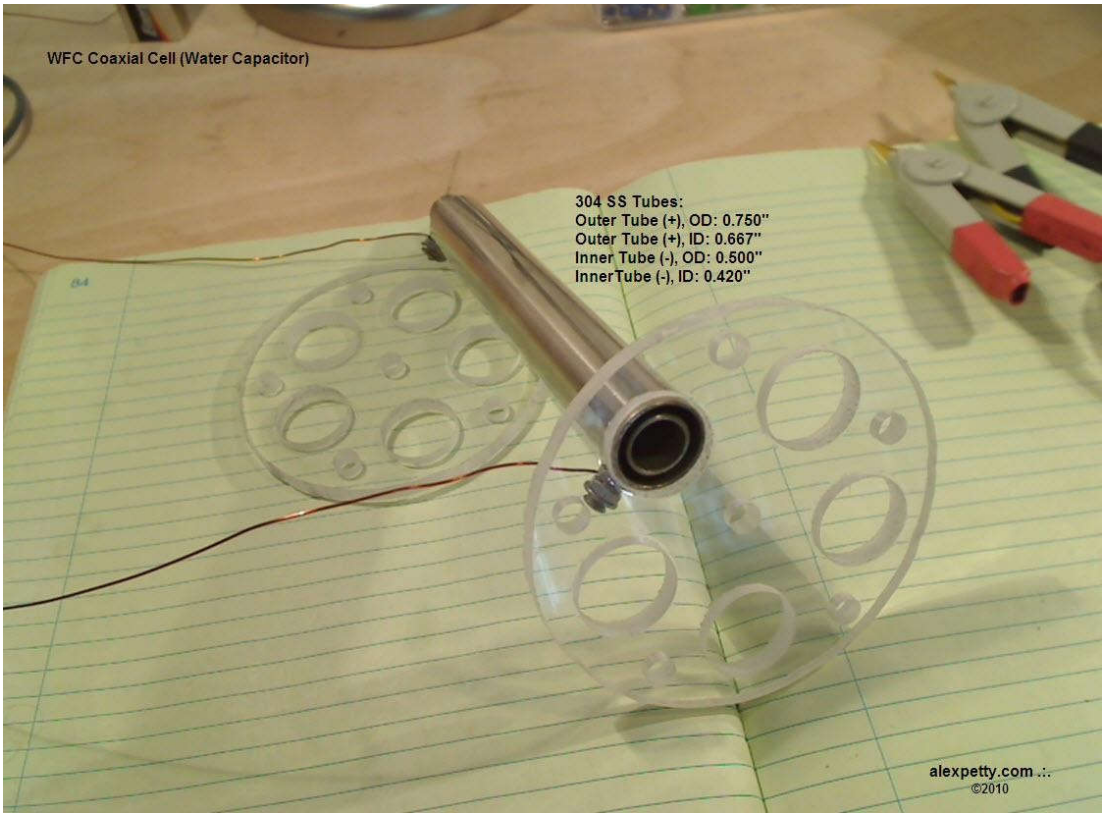
HYDROGEN
DISSOLVED GASES
OXYGEN
WATER LEVEL
B
WATER
FUEL CELL WATER CAPACITOR
A



Illustrations 4-6: Meyer's cells.


WFC Coaxial Cell (Water Capacitor)
304 SS Tubes:
Outer Tube (+), OD: 0.750"
Outer Tube (+), ID: 0.667"
Inner Tube (-), OD: 0.500"
InnerTube (-), ID: 0.420"
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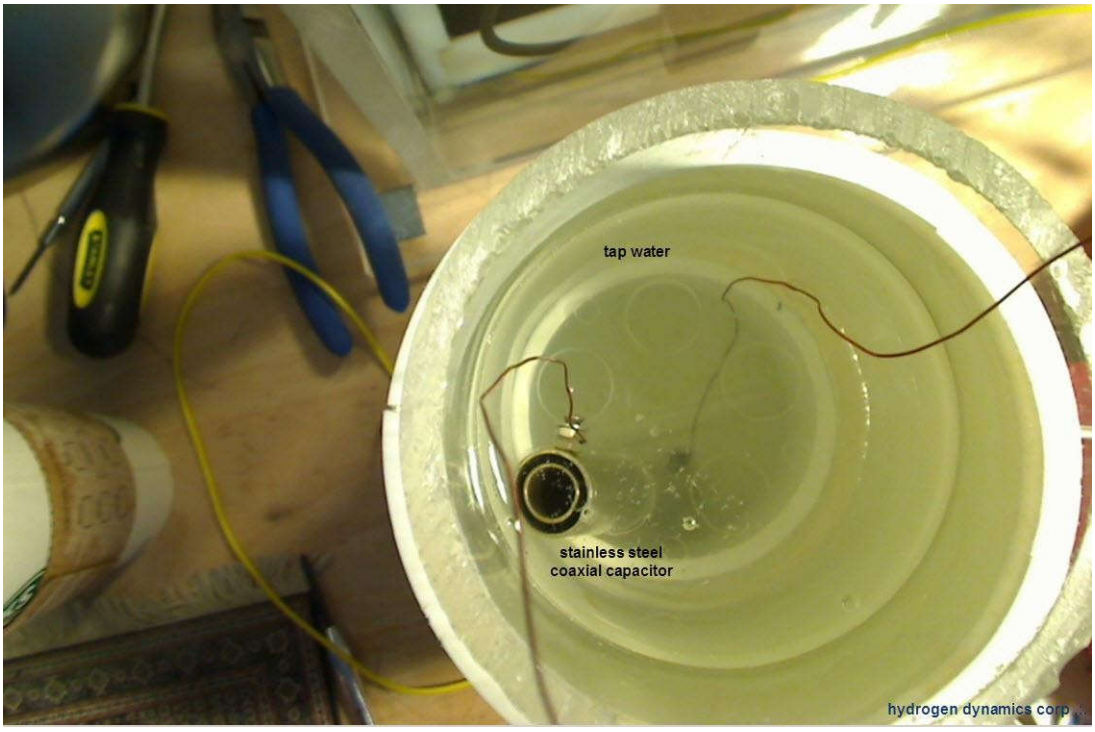
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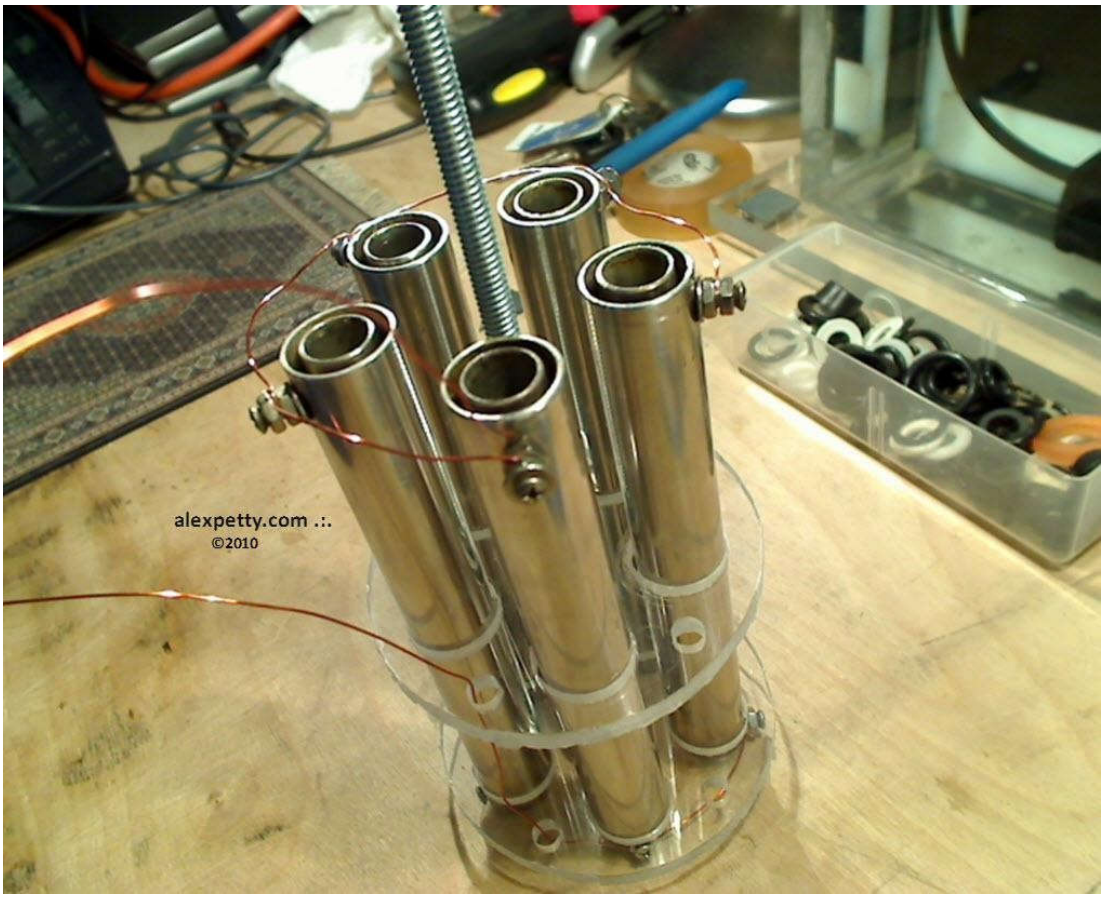
coaxial capacitor
hydrogen dynamics corp



Illustrations 7-9: Experimental apparatus (source: www.alexpetty.com)

DISCUSSION AND CONCLUDING REMARKS

The above three examples hopefully give us clear cases when new technologies are not always coming with a good prospect for humanity's better future.

Especially when we consider the possibility of tactical robots, or harmful radiation of 5G network (which have begun to be implemented in several countries). But it is unlikely that we can stop them to progressing, so what we can do is to start open/public dialogue among scientists and general public, on whether we will pursue further with that black ball, or humanity should divert away from such technologies.

In the third example, we see that a clearly reliable invention which can lead to break away to fossil fuel-dependency has in the past been blocked (possibly) by people in the elite circle. Again, an open/public dialogue shall begin to consider which path to future energy is better for humanity.

Version 1.0: 9 sept. 2021, pk. 21:32 VC & FS

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Small Tech, High Touch: A Permutation

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ABSTRACT

In an earlier paper published in a neutrosophic math journal (IJNS), we discussed a new approach to technology, which may be called as 'opti-realism' or 'pess-optimism' as alternative to utopianism based on technocracy, which may lead the world into global techno-totalitarianism. In this article, we submit a new approach to Nature and technology, which is more modest and humble, rather than a techno-utopianism version of reality that most futurists argue for. Our proposed approach resembles more to Myer-Briggs 16 types of personality, including IJNS, IFNS etc. In our scheme, there are 8 characters of approach toward technology which can lead to many variations or we call it 'Permutation." Of course, if the readers ask one variation that we prefer, we would answer: Small Tech, High Touch.

KEYWORDS: *Opti-Realism, Small Tech High Touch, Permutation*

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INTRODUCTION

In line with the rapid development of new branch of foundational mathematics, i.e. Neutrosophic Logic, in an earlier paper we discuss potential application of NL theory in the field of futurology (Florentin Smarandache, Victor Christianto, 2020). [9]. See for recent papers on NL: (Ranjan et al, 2018; Tuhin et al., 2018; Riad et al., 2018; Vakkas et al., 2018) [10-13].

In this context, about two decades ago, John Naisbitt - a prominent futurologist - published his book *High Tech, High Touch (*John, 2001) [1]. After that, there were many publications and research on efforts to apply the high tech and high touch concepts, for example in the field of customer service and hospitality, see for example (Micah, 2015) [2].

If Naisbitt's book on high tech and high touch looked for as an opponent, we will encounter: low tech and low touch. Are there perhaps areas where low tech and low touch are still relevant?

On the other spectrum, the convergence of technology and also ecological/environmental considerations, leads us to two other possibilities: small tech and also tech wise, the opposites of which are big tech and unwise tech. Of course, it is quite clear that the right technology sometimes does not need to be large and sophisticated, sometimes simple technology

such as a small gas stove, is sufficient for household use in rural areas.

Our proposed approach resembles more to Myer-Briggs's 16 types of personality, including IJNS, IFNS etc.[1] In our scheme, there are 8 characters of approach toward technology which can lead to many variations or we call it 'Permutation."

PERMUTATION

Without pretending to debate this topic at length, let's do a simple permutation game. For example:
A0 = low tech; A1 = high tech; B0 = low touch; B1 = high touch; C0 = small tech; C1 = big tech; D0 = wise tech; D1 = unwise tech.

So we now have 8 traits of approach in technology. Of course it becomes simpler if Naisbitt's simple proposition: high tech and high touch is denoted as A1-B1.

Then we now permutate the possible combinations:

a. A0-B0

b. A1-B0

c. A0-B1

d. A1-B1

e. A0-C0

f. A1-C1

g. A0-D0

h. A0-D1

And so on. We can continue this permutation into a combination of 3 and a combination of 4 parameters, for example: A0-B1-C0-D0, and so on.

IMPLICATION: TOWARD SITUATIONAL TECHNOLOGY

Personally, these writers are more inclined towards appropriate technology. For example in the development of renewable energy, in a previous article, the author has mentioned the term ART (a*ppropriate renewable technology*). In the spectrum of possibilities above, ART can be classified into: C0-D0, but can also be combined with A0 / A1 or B0 / B1.

But of course this choice needs to consider the context or situation and location in which we must apply the technology.

If it is possible to use the analogy of situational leadership (situational leadership), perhaps this approach can be called: *situational technology choice* (STC). Or those who prefer to use context terms, can use phrases: technology in context.

APPLICATIONS

Does it sound a little too abstract, and less practical?

Let us consider one of the problems, namely distance learning in this pandemic situation (context).

Perhaps a high tech and high touch solution for the problem in question is to provide multimedia high-speed Internet-based education services so that students do not have to go to school each day (combination A1-B1). But perhaps this solution is only suitable in *urban areas* where students are accustomed to using gadgets with mobile internet networks available throughout the city.

But what about small towns or rural areas where 3G / 4G networks are still difficult to reach?

Maybe we need to think about a solution with a different combination, for example A0-C0-D0 (*low tech, small tech, wise tech*). Is there a solution?

Several possibilities that might be considered:

a. Radio over IP. The latest developments, if I'm not mistaken, are DMR (digital mobile radio) and IP Simulcast.
b. School-based radio channel: perhaps small-town schools could consider collaborating with

a local radio station. Because radio infrastructure is more affordable, with a good schedule, the teaching process can be done via radio, perhaps a term that can be popularized: "raducation." (education based on radio)
c. Another possibility, for example for more remote areas, is to develop a community radio, or community-based radio channel. It seems a little difficult, considering remote areas also have difficulties in technical personnel, but at least this is one possibility (Christiany, 2015) [6-7].

Science, *techne* and dialogical communication
Now let us put the aforementioned discussions on technological choices and approach to nature into a more philosophical perspective.

It is known that there are natural sciences, social sciences, and emancipatory sciences etc. The main distinction between natural sciences and social sciences is mostly about what and whom to control: in natural sciences, a scientist tries to control nature through comprehension of certain aspects of nature (Stott & Beelders, 2019) [8], which then they be reduced into some kind of laws of nature. In social sciences, a scientist tries to achieve more understanding (*verstehen*[2]) of certain people or society, in order to properly do dialogue with that society/people. Therefore, it is wrong if a social scientist tries to "control" the society in question in order to fulfil his/her goals, because human beings should not be an object of control, but as mutual partners of dialogue.

Many problems that we found in society come from two chief misapplied sciences: natural sciences which becomes "techne"[2] or technology, which not only aiming to control Nature, animals and so on, but also control people and society. And also, social sciences which work in wrong way to not do dialogical communication to achieve goals as community, but to control each other.

What is distinction between *techne* and episteme? See this entry, which can be paraphrased as follows:

"…a portion of the highlights of this contemporary qualification among hypothesis and practice are not tracked down in that frame of mind among epistêmê and technê. Others are tracked down in a fairly refracted style. As we move sequentially from Xenophon to Plotinus, we go from a not creator recognize the two terms, to a little creator use for technê in light of the fact that it is such a long ways from what he views as genuine. It is in Aristotle that we find the reason for something like the advanced resistance between epistêmê as unadulterated hypothesis and technê as training. However even Aristotle alludes to *technê* or create as itself likewise epistêmê or information since it is a training grounded in an 'account' — something including hypothetical comprehension. Plato — whose hypothesis of structures appears to be a curve illustration of unadulterated hypothetical information — by and by is intrigued by the possibility of a sort of *technê* that is educated by information on structures. In the Republic this information is the fundamental reason for the thinkers' specialty of administering in the city. Getting one more topic in Plato's discoursed, the Stoics foster the possibility that prudence is a sort of technê or art of life, one that depends on a comprehension of the universe. The connection, then, at that point, among *epistêmê and technê* in old way of thinking offers a fascinating differentiation with our own ideas about hypothesis (unadulterated information) and (experience-based) practice. There is a close sure relationship among epistêmê and technê, as well as an essential differentiation."[3]

To these wrong applications of science, which often happen because of either socialism or capitalism, then comes a third possibility: emancipative sciences, which are aiming to liberation to the aforementioned "*techne*" stronghold.

Last but not least, our suggestion to adopt situational technology choice is intended to suit each technology in a particular location and geography; nonetheless when educators wish to integrate these choices of technology into students' learning process, they shall learn how to introduce to them by virtue of Bloom's taxonomy and Vygotsky ZPD approach, for instance.

Figure 1: Bloom's taxonomy to integrate technology (cf. [15])

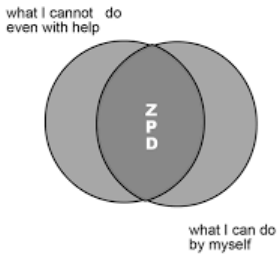

Figure 2: Vygotsky ZPD

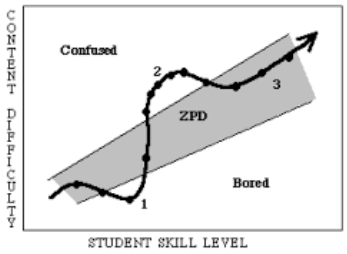

Figure 3: Vygotzky ZPD, to introduce new things in tune with student's skill level

CONCLUDING REMARKS

Thus, a few simple thoughts may be useful for educators and also schools that will start the teaching and learning process in the next academic year. In this paper the technical aspects are deliberately not discussed, because this requires separate considerations.

To summarize the aforementioned arguments, in the present article we submit a new approach in relation to Nature and technology, which is more modest and humble; rather than a techno-utopianism version of reality that most futurists argue for. Our proposed approach resembles more to Myer-Briggs 16 types of personality, including IJNS, IFNS etc. In our scheme, there are 8 characters of approach toward technology which can lead to many variations or we call it 'Permutation."

In this sense, small tech-high touch can be viewed as one way to counter the pragmatic-hegemonic practices of techno-utopianism, especially with high tech, big tech approach.
That is our perspective, which may be influenced by people-centered economics-way of thinking cf. E.F. Schumacher, along with dialogical philosophy of Martin Buber (a Jewish philosopher).

Added note:
[1]As an alternative to Myer-Briggs's personality types, FS has developed his own Neutropsychology scheme. In psychology, he introduces:
Neutropsychic Personality that is a neutrosophic dynamic open psychological system of tendencies to feel, think, and act specific to each individual.
Neutrosophic Refined Memory: that restructured the division of memory
into: *consciousness*, *aconsciousness* (which he introduced as a blend of *consciousness* and *unconsciousness*), and *unconsciousness*. *Aconscious* was further subdivided into *preconscious, subconscious, semiconscious* = *semiunconscious, subunconscious,* and *preunconscious*. All memories have degrees of conscious (c), acounscious (a), and unconscious (u).
Refined Neutrosophic antiTrait –Trait Diagram, that each individual has a *degree of antiTrait* and a *degree of Trait* with respect to each antiTrait-Trait personality pair. And the *Neutrosophic Temperament*. Interested readers are advised to consult [14].
[2]https://medium.com/@umfarooq0/verstehen-max-weber-and-an-approach-to-social-sciences-f95ad578aa9b
[3]https://plato.stanford.edu/entries/episteme-techne/

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Insecticidal Activities of Four *Citrus* Essential Oils on the Bean Weevil Longevity, *Acanthoscelides obtectus* Say. (Coleoptera: Bruchidae)

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ABSTRACT

The study focuses on the evaluation of the insecticidal potential of Citrus limonum, C. sinensis, C. paradisi and C. aurantium as bioinsecticides to reduce the damage caused by the pest Acanthoscelides obtectus on white bean crops. The toxicity of essential oils extracted from 04 species of Citrus was tested under laboratory conditions at 30°C and 70% RH by three modes of action contact, inhalation and repulsion on the A. obtectus adults longevity. The results obtained for the parameter studied indicate that the essential oils extracted from C. limonum, C. sinensis and C. paradisi exert a more or less significant toxicity towards the insect pest for all the tests carried out, however the oil extracted from C. aurantium is the most effective since the A. obtectus longevity decreases from the lowest dose of 2µl and is 100% at 6µl. Regarding the inhalation test, the fumigation effect is very important from the lowest doses achieved with C. aurantium essential oil, on the other hand the other oils have only shown significant effectiveness at the highest doses. The results of the repellency test revealed that C. aurantium essential oil is the most repellant compared to the other essential oils tested.

KEYWORDS: *Acanthoscelides obtectus*, *Bean, Citrus*, *Essential Oils, Toxicity, Longevity.*

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INTRODUCTION

The bean weevil, *A. obtectus* Say, is a potentially ubiquitous cosmopolitan insect that can infest its host plant *Phaseolus vulgaris* both in the field and in storage. It is a polyvoltine species whose dispersal is closely linked to human societies (Hossaert-McKey et Alvarez, 2003). The damage is due to the larvae which penetrate the seed of *P. vulgaris* and consume the reserves contained in the cotyledons (Stamopoulos et Huignard, 1980). According to Regnault-Roger et Hamraoui (1997), this insect infests other legumes, which are food crops of great economic importance for developing countries such as cowpea (*Vigna unguiculata*), broad bean (*Vicia faba*) and chickpea (*Cicer arietinum*). Stored products are generally protected by the application of synthetic insecticides, but the presence of toxic residues in foodstuffs and the

appearance of strains of insects resistant to these products are becoming more and more frequent. The plants have been the subject of numerous studies with a view to reducing the losses caused by insect pests of stored seeds by their insecticidal effects, particularly against Bruchiidae. According to Rajapakse *et al.* (1998); Tunç *et al.* (2000); Keita *et al.* (2001), foods such as citrus fruits (*C. limonum*, *C. sinensis*, *C. aurantium*, *C. paradisi*, etc.) have great resistance to insect attacks and could contain substances effective against pests. The present study aims to assess the impact of essential oils extracted from four species of *Citrus* on the adults of *A. obtectus* longevity. obtained by contact, inhalation and repulsion.

MATERIAL AND METHODS

Laboratory equipment

Several tools necessary to approach our experimental work such as the oven equipped with a thermometer and a humidifier, adjusted to have the most favorable conditions to ensure rapid development of the bean weevil, namely a temperature of 30 ±1°C and a relative humidity of 70 ±5%. The small laboratory equipment includes glass jars for the mass rearing of bruchids as well as for the inhalation test, glass Petri dishes for carrying out the contact and repulsion tests, a binocular magnifying glass for determine the sex of *A. obtectus* individuals, a micropipette for the dosage of essential oils used.

Biological material

The essential oils of four aromatic plants belonging to the genus *Citrus*, whose extraction is carried out in the laboratory, are used for the study, *C. limonum* (lemon), *C. sinensis* (sweet orange), *C. paradisi* (grapefruit) and *C. aurantium* (bitter orange).

The species studied is *A. obtectus* which is obtained from mass rearing carried out in the laboratory. Mass rearing is a method that consists of bringing bruchids male and female of indeterminate ages into contact with bean seeds not treated with insecticides, in glass jars in order to produce a large and sufficient number of individuals. Aged between 0 and 24 hours required for the various experimental tests. For the duration of the experiments, the jars were kept in the dark at a temperature of 30 ± 1°C and the humidity of 70 ± 5% RH in a conditioned oven.

Oil contact test: 25g masses of beans are placed in glass Petri dishes and then treated with the four *Citrus* oils (Lemon, sweet orange, grapefruit and bitter orange) at different doses for each (2, 4, 6, 8 and 10µl) using a micropipette. These doses are dispersed homogeneously in the seeds. A batch of 5 pairs of *A. obtectus* less than 24 hours old is introduced into each box while control batches are made with untreated seeds. Four repetitions are carried out for each essential oil, each dose and each control batch.

Inhalation test: In jars of one liter volume, small masses of cotton are suspended using a thread attached to the inside of the lid. Doses of 4µl, 8µl, 12µl, 16µl and 20µl of each *Citrus* essential oil were introduced into the cotton using a micropipette. Five pairs of adult weevils less than 24 hours old are placed in jars whose closure is perfectly sealed. Four repetitions were carried out for each treatment and in parallel a control sample was carried out. The count of dead individuals is carried out for each dose after 24 hours, 48 hours, 72 hours and 96 hours of exposure.

Repulsion test: 11cm diameter filter paper discs were divided into two equal parts; four doses of 10, 20, 30 and 40µl of each essential oil used were prepared by dilution in 0.5ml of acetone. One half of the paper is treated with oil plus acetone and the other half is treated with acetone only. After evaporation of the solvent, the disc was reconstituted using an adhesive strip and then placed in a Petri dish in the center of which are placed 5 pairs of *A. obtectus*. Four repetitions were carried out for each dose of essential oil used. After half an hour of exposure, the individuals are counted on each part of the disc. The percentage of repulsion is calculated by the following formula:

PR (%)= [(Nac-Nsh) / (Nac+Nsh)] ×100

- Nac is the number of individuals present on the part treated only with acetone.

- Nsh is the number of individuals present on the part treated with the oily solution.

Statistical analysis: The results obtained are subjected to an analysis of variance with one or two classification criteria using the Stat Box software, version 6.3 to determine the action of essential oils against bruchid of the bean and to analyze the biological parameter studied. When this analysis shows significant differences, it is supplemented by the Newman and Keuls test.

RESULTS

The results obtained show that the longevity of *A. obtectus* adults is inversely proportional to the dose of the essential oils tested, it is on average 11.56 ± 1.74 days in the control batches (Table 1). It should be noted that the 4 essential oils used express toxicity towards adults of *A. obtectus*. A slight decrease in longevity is recorded from the lowest dose of 2µl. It is 8, 9, 8.75, 3.5 days, values corresponding respectively to the essential oils of lemon, orange, grapefruit and bitter orange. The latter induces 100% mortality at a dose of 6 µl before 24 hours of exposure, while the others cause 100% mortality at a dose of 10 µl before 12, 30 and 18 hours of exposure respectively for the oils of the lemon, orange and grapefruit.

Table 1: Mean longevity in days (± standard deviation) of *A. obtectus* adults according to the dose and type of essential oil used.

Dose / Essential oils	0µl	2 µl	4 µl	6 µl	8 µl	10 µl
Lemon	12.00±2.08	8.00±2.21	6.75±1.70	4.00±1.41	1.75±0.81	0.50±0.50
Orange	11.50±0.57	9.00±0.81	7.25±0.50	5.50±0.57	2.25±0.95	1.25±0.50
Grapefruit	11.00±0.81	8.75±0.95	7.25±0.95	5.75±0.50	2.00±0.81	0.75±0.95
Bitter orange	11.75± 0.5	3.5±0.57	1.75±0.5	0.00	0.00	0.00

The oil extracted from the bitter orange tree is the most toxic; because the longevity undergoes a significant reduction (3.5 days) from the lowest dose and is canceled at the dose of 6 µl.

The analysis of variance with two classification criteria reveals a very highly significant difference for the essential oil (P = 0.0016) and dose (P = 0.0000) factors (Table 2).

Table 2: Analysis of variance at the 5% threshold for the longevity parameter of *A. obtectus* adults treated with the four *Citrus* essential oils.

	S.C.E	DDL	C.M.	Test F	Proba	E.T.	C.V.
Var. Total	393,9766	23	17,1294				
Var. Factor 1	42,0912	3	14,0304	8,4226	0,00169		
Var. Factor 2	326,8985	5	65,3797	39,2483	0		
Residual Var. 1	24,9869	15	1,6658			1,2907	25,34%

The Newman and Keuls test, at the 5% significance level, classifies the four essential oils used in two homogeneous groups (Table 3).

Table 3: Result of the Newman and Keuls test concerning the effect of the essential oil factor on the longevity of *A. obtectus* adults.

F1	Essential oils libels	Average longevity	Homogeneous groups	
2.0	Orange	6,125	A	
3.0	Grapefruit	5,9167	A	
1.0	Lemon	5,5	A	
4.0	bitter orange	2,8333		B

The Newman and Keuls test, at the 5% significance level, classifies the 6 doses used in 4 homogeneous groups (Table 4).

Table 4: Result of the Newman and Keuls test concerning the effect of the oil dose factor on the longevity of *A. obtectus* adults.

F2	Essential Oils libels	Average longevity	Homogeneous groups			
1.0	0ul	11,5625	A			
2.0	2ul	7,3125		B		
3.0	4ul	5,75		B	C	
4.0	6ul	3,8125			C	
5.0	8ul	1,5				D
6.0	10ul	0,625				D

For the inhalation test, the results show that the adult mortality rates of *A. obtectus* are proportional to the two dose and time factors for the four essential oils used (Tab.5). The lowest percentage of mortality is recorded for the essential oil of *C. sinensis* with an average of 18.33% over all the doses and durations of exposure, while the highest is recorded for the *C. aurantium* essential oil with an average of 79.27% over all doses and durations of treatment and after 24 hours of exposure and at a dose of 16 µl the mortality is 100% therefore, this one has the greatest inhalation effect on adults of *A. obtectus*.

Table 5: Average mortality rate (%) of adults of *A. obtectus* tested with *Citrus* oils according to doses and duration of treatment.

Essential oils	*C. limonum*				*C. sinensis*				*C. parasidi*				*C. autrantium*			
Duration Doses	24H	48H	72H	96H	24H	48H	72H	96H	24H	48H	72H	96H	24H	48H	72H	96H
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	7.5	20	27.5	0	0	0	0	0	0	0	7.5	47.5	92.5	100	100
8	7.5	12.5	32.5	40	0	0	12.5	27.5	0	7.5	20	30	72.5	100	100	100
12	12.5	30	37.5	57.5	0	10	17.5	30	7.5	12.5	30	40	90	100	100	100
16	27.5	37.5	50	75	10	22.5	40	60	22.5	30	42.5	62.5	100	100	100	100
20	67.5	70	82.5	92.5	22.5	50	60	77.5	30	57.5	70	82.5	100	100	100	100

The analysis of variance with three classification criteria reveals that there is a very highly significant difference for both the essential oil factor (P=0.0000), the dose factor (P=0.0000) and the time factor (P=0.0000), however the interactions between the factors do not show significant differences; their probabilities are 0.1891 and 0.0695 respectively for the essential

oil-dose and dose-time interaction. The statistical test of Newman and Keuls classifies the 4 species of *Citrus* essential oils in 3 homogeneous groups for the parameter mortality rate of *A. obtectus* adults by inhalation effect (Tab. 6). The Newman and Keuls test, at the 5% significance level, classifies the 6 doses of essential oils in 6 homogeneous groups (Table 7).

Table 6: Result of the Newman and Keuls test concerning the effect of the essential oil factor on the mortality of *A. obtectus* individuals tested by inhalation.

F1	Essential oil libels	Mean Mortality	Homogeneous Groups		
4.0	***C. autrantium***	79,2708	A		
1.0	***C. limonum***	33,1875		B	
3.0	***C.parasidi***	23,0208			C
2.0	***C. sinensis***	18,3333			C

Table 7: Result of the Newman and Keuls test concerning the effect of oils on the mortality of *A. obtectus* adults tested by inhalation.

F2	Essential oil libels	Mean Mortality	Homogeneous Groups					
6.0	20ul	72,6563	A					
5.0	16ul	55		B				
4.0	12ul	43,3125			C			
3.0	8ul	34,5938				D		
2.0	4ul	25,1563					E	
1.0	0ul	0						F

The analysis of variance with three classification criteria reveals that there is a very highly significant difference for both the essential oil factor (P=0.0000), the dose factor (P=0.0000) and the time factor (P=0.0000), however the interactions between the factors do not show significant differences; their probabilities are 0.1891 and 0.0695 respectively for the essential oil-dose and dose-time interaction. The statistical test of Newman and Keuls classifies the essential oils of the 4 species of *Citrus* in 3 homogeneous groups for the parameter mortality rate of *A. obtectus* adults by inhalation effect (Tab.8). The Newman and Keuls test, at the 5% significance level, classifies the 6 doses of essential oils in 6 homogeneous groups (Table 9).

Table 8: Result of the Newman and Keuls test concerning the effect of the oil factor on the mortality of *A. obtectus* individuals tested by inhalation.

F1	Essential oil libels	Mean Mortality	Homogeneous Groups		
4.0	***C. autrantium***	79,2708	A		
1.0	***C. limonum***	33,1875		B	
3.0	***C.parasidi***	23,0208			C
2.0	***C. sinensis***	18,3333			C

Table 9: Result of the Newman and Keuls test concerning the effect of oils on the mortality of *A. obtectus* adults tested by inhalation.

F2	Essential oil libels	Mean Mortality	Homogeneous Groups					
6.0	20ul	72,6563	A					
5.0	16ul	55		B				
4.0	12ul	43,3125			C			
3.0	8ul	34,5938				D		
2.0	4ul	25,1563					E	
1.0	0ul	0						F

Concerning the test by repulsion, we observe that the number of bruchids decreases in the treated parts with the increase in the dose of essential oil used (Table 10), however the most considerable effects are recorded at the dose of 40µl with percentages repellent of 75%, 35%, 65% and 85% respectively for lemon, orange, grapefruit and bitter orange essential oils.

Table 10: Average number of bruchids identified in the filter paper at different doses of essential oils used.

Essential oils	Doses (µl)	Number of bruchids present		Repulsion (%)
		Treated part	Untreated part	
C. limonum	10	3.75	6.25	25
	20	3.00	7.00	40
	30	2.00	8.00	60
	40	1.25	8.75	75
C. sinensis	10	4.75	5.25	5
	20	4.75	5.25	5
	30	3.75	6.25	25
	40	3.25	6.75	35
C. paradisi	10	4.50	5.50	10
	20	3.25	6.75	35
	30	2.00	8.00	60
	40	1.75	8.25	65
C. aurantium	10	3.00	7.00	40
	20	1.25	8.75	75
	30	1.00	9.00	80
	40	0.75	9.25	85

The results present in table 11 shows that the lowest repellency rate is recorded with *C. sinensis* essential oil with an average of 17.5%, while the highest is recorded with *C. aurantium* essential oil with an average of 70%. For the other two essential oils we noted repulsion rates of 50% and 42.5% respectively for *C. limonum* and *C. paradisi* essential oil.

According to McDonald and *al.* (1970), the essential oils used are divided into the following repellent classes (Table 11).

Table 11: Classification of essential oils according to their repellent properties

Essential oils	***C. limonum***	***C. sinensis***	***C. paradisi.***	***C. aurantium***
Repulsion %	50%	17.5%	42.5%	70%
Repellent class	III	I	III	IV
Effect	Moderately repellent	Very weakly repellent	Moderately repellent	Repellent

DISCUSSION

The study carried out on the insecticidal action of four *Citrus* essential oils on the longevity of adult bean weevil *A. obtectus* shows that the essential oils tested express toxicity and induce significant mortality from the lowest doses. Our results are consistent with the work of several authors who have highlighted the action of essential oils on the longevity of stored food pests. Regnault-Roger and Hamraoui (1995) found a toxic effect of monoterpenes on bruchid *A.obtectus*. These authors report linalool being the most toxic and estragole being the least. This may explain the results of our experimentation which showed that the essential oil extracted from bitter orange is the most toxic, since it is richer in linalool and linalyl acetate. Indeed, Haubruge *et al.* (1989) tested the toxicity of five *Citrus* essential oils against three beetles, the results of the test by contact of the treated grains indicated that the essential oil extracted from the sour orange tree is the most effective simultaneously against *Sitophilus zeamais*, (Coleoptera: Curculionidae), *Prostephanus truncatus* (Coleoptera: Bostrychidae) and *Tribolium castaneum* (Coleoptera: Tenebrionidae). These authors also found that *S. zamais* is the most sensitive to these essential oils since they noted for this insect a mortality of 96% at a dose of 5µl of bitter orange oil after 7 days of exposure. For the test by topical application, the work of these authors has shown that the longevity of *P. truncatus* is one day at a dose of 2µl of bitter orange essential oil. Indeed, mortalities of 28%, 98%, 34% and 24% of *S. zamais* adults were recorded at a dose of 2µl after 24 hours, respectively for oils of sweet orange, bitter orange, lemon and grapefruit. Hamani-Aoudjit (2019) indicates that on adults of diapausing *Bruchus rufimanus* the essential oils extracted from two plants of the Lamiaceae family *Origanum vulgare* (LD50=3.23µl/cm2 and 1.88µl/cm2 for females and males respectively) and *Salvia officinalis* (LD50=3.68 µl/cm2 and 3.02 µl/cm2 for females and males respectively) show a significant insecticidal effect by contact. Bouchikhi Tani *et al*. (2011) demonstrated the insecticidal effect of the essential oil extracted from *Origanum glandulusum* on the adults of three bruchids *A. obtectus*, *B. rufimanus* and *Callosobruchus maculatus*. They showed that this oil is very toxic on *A. obtectus* (DL50=1.44µl/30g of seeds, presents a slightly variable toxicity on *C. maculatus* (DL50=2.60µl/30g of seed, and less toxic on *B. rufimanus* with LD50=7.72µl/30 g of seeds. They explained this reduction by the richness of the oil of *O. glandulosum* by insecticidal components, this is the case of Thymol, p-cynene, γ-Terpinene, limonene, α-pinene, linalool and carvacrol Weaver and *al.* (1991) found that linalool extracted from a plant of the Lamiaceae family, namely *Ocimum canum*, has a very significant effect on the longevity of adults of *A. obtectus*, *Zabrotes subfasciatus* (Coleoptera: Bruchidae), *Rhyzopertha dominica* (Coleoptera: Bostrichidae) and *Sitophilus oryzae* (Coleoptera: Curculionidae), in fact, a very marked effect is recorded before a treatment period of 48 hours. Bittner et *al.* (2008) tested the toxicity of essential oils from five aromatic plants on *A. obtectus* and *S. zeamais*, their results reveal that the oils extracted from *Eucalyptus globulus* (Myrtaceae) and *Thymus vulgaris* (Lamiaceae) are the most toxic on *S. zeamais*, while the essential oils of *Gomortega keule* (Gomortegaceae) and *Laurelia sempervirens* (Monimiaceae) are the most toxic on *A. obtectus*. In addition, our results corroborate those of the work of several researchers who have highlighted the toxicity of essential oils by way of inhalation or fumigation with regard to the pests of stored foodstuffs. According to Haubruge *et al.* (1989), the effect of five essential oils of *Citrus* applied by inhalation on the sheets of filter paper, reveals that the essential oil of the orange tree is the most toxic with regard to both

Sitophilus zeamais, *Prostephanus truncatus* and *Tribolium castaneum*. According to Don Pedro (1996), the essential oil extracted from lemon zest applied by way of fumigation on *C.maculatus* and *Dermestes maculatus*, respectively at doses of 7.8 and 21.5ul/l of air causes a mortality of 50% for the eggs of these two insects. Hedjal-Chebheb *et al.* (2022) noted that the two essential oils of *E. cinerea* and *E. maidenii* caused 100% mortality in *Sitophylus oryzae* and *Callosobruchus maculatus* adults, at a dose of 12.5 µl/l, for 24 and 72h exposure, respectively. Several authors have also noted a difference in the mortality of pests depending on the duration of exposure to essential oils. Thus, Kim *et al.* (2003) obtained a 90% mortality of *S. oryzae* adults treated with the essential oil of *Brassica juncea*, *Cinnamonum cassia* and *Cocholeria Arocaria*, with a dose of 3.5mg/cm², after one day exposure; whereas with the other essential oils *Acarus calamus*, *Acarus gramineus* and *Agastache rugosa*, the mortality rate is 100% after 3 days of exposure. It appears that the mode of action of essential oils against insects is attributed largely to the penetration of the terpene compounds in the respiratory system. Kim *et al.* (2003), who have studied the fumigation of essential oils on *S. oryzae* and *C. chinensis*, obtained results which show that toxicity depends on the insect species, the plant and the time of exposure to the essential oil. Temet and *al.* 2020 indicates that the essential oil of *R. officinalis* causes high mortality from 10 µl. Kotan *et al*. (2010) report that *Salvia hydrangena* has insecticidal activity by fumigation on adults of *T. confusum* with mortality varying from 68.3 and 75%. Moreover, the repellent effect of certain essential oils has been observed by many researchers, thus Ndomo *et al.* (2009) report that after two hours of exposure, the different doses of the essential oil from the leaves of *Callistemon viminalis* (from 0.031 to 0.25 µl/cm2) caused repulsion, the rate of which varies from 36.6 to 80% against adults of *A. obtectus* adults. This clearly shows that the results of our study for the test by repulsions are in conformity with the work of these authors who reveal that the repulsion increases according to the dose of the essential oil used. Taleb *et al.* (2014), the essential oil of *E. globulus* has been shown to be highly repulsive at a dose of 12.5µl/l against *C. maculatus*. Thus, according to the results obtained, the oils tested can be used to fight against stored grain insects in general and *A. obtectus* in particular, representing an effective alternative that is more respectful of the environment.

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A Study on the Allelopathic Impact of *Chenopodium murale* L. on Wheat Crop Plants

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ABSTRACT

Allelopathy is a mutual biological occurrence in which the growth, development, and reproduction of other organisms are impacted by the biochemicals produced by one organism. Allelochemicals are a class of biochemicals that can either benefit or harm the target species. Plant allelopathy is one of the ways that receptor and donor plants interact, and it can have either beneficial or negative effects. Organic soluble plant extracts have an inhibitory impact. A dose–response relationship analysis is required in bioassay laboratory tests, since the stronger inhibitory impact of higher concentration extracts may be attributed not only to allelopathy but also to enhanced osmotic potential. The negative effect on seedling growth is often larger in bioassays than the influence on germination rate. To study the effect of Chenopodium on wheat crop was studied by applying leaf extract of Chenopodium murale on wheat plant. The weed samples of C. murale were collected from fields and road sides of the University. The different concentration of Chenopodium extract (i.e. 50%, 75%, 100%) were appliedon wheat plants. The results after three days were compared with the control. The result shows that Chenopodium has less inhibitory effect at lower concentration and strong inhibitory effect at higher concentration.

KEYWORDS: *Allelopathy, Allelochemicals, Chenopodium, Wheat, Inhibitory effect.*

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INTRODUCTION

Weeds and agricultural plants are located near to one another. They deny agricultural plants the meagre nutrients, accessible space, light, and moisture that they need to grow. (Singh et al., 2020). Because of this when weeds are prevalent, the physiological function and growth of crops are impaired (Rajcan and Swanton, 2001).The conflict between weeds and crops reduces agricultural output. Of all the crop pests, it is known that weeds cause the biggest yield reductions in crops. Crop productivity is often reduced by 34% by weeds (Jabran et al., 2015). Allelopathy is a subfield of chemical ecology that examines how chemicals produced by plants or microorganisms affect the emergence, development, and dispersion of other plants and organisms in natural communities or agricultural systems. Since the mid-1990s, allelopathy research has advanced quickly, becoming a hot issue in recent years in the fields of horticulture, ecology, agronomy, soil science, and other scientific disciplines (Einhellig, 1995). Allelopathy research flourished in the 1970s.Root and shoot may be hampered by allele-chemicals produced by allele-pathic weeds. Weeds have a negative in direct impact

on crop plants. Crop development is impacted by allelopathy from specific emerging crop seedlings, which also results in a number of other issues. Recent research has demonstrated that the allelochemicals released by *Chenopodium murale* L. root hairs are to blame for wheat's cell cycle disruption and oxidative damage (Dmitrovic et al., 2014). By serving as a new habitat for a range of insect pests and plant diseases, weeds can lower agricultural productivity. Because it requires money to control them, weeds can make it difficult to harvest crops and drive up production expenses. Allelochemicals produced by donor plants can considerably affect and, in some situations, impede the growth of receiver (test) plants in allelopathy, a chemical interaction between higher plants (Singh et al., 2021). Allelochemicals are substances that plants release that may be allelopathic, it describes a wide range of substances created by either plants or animals. Plant secondary metabolites are known as allelochemicals (alkaloids, phenolics, flavinoids, terpenoids, and glucosinolates) that are essential for the survival of plants but do not participate in their basic metabolic process. (Duke et al., 1998, Rice, 1984; Dekker and Meggitt, 1983).Plants produce secondary metabolites which are known as allelochemicals, these allelochemicals are natural herbicides are a single plant compound or a combination of plant compounds that may naturally suppress weeds. The most harmful weed on a global scale is *Cynodon dactylon* and *Chenopodium album*, which also ranks fourth among weeds in terms of production of allelopathic chemicals. In addition to reducing germination, the allelopathic effect also delays the period of germination, which may affect plant competition (Putnam, 1988).

Worldwide, *Chenopodium album* and *Chenopodium murale* can be found. Western Asia is assumed to be the origin of *C. album*, but this isn't proven (Anonymous 2017). A perennial tall plant that may yield up to 24,000 seeds per plant, *Chenopodium murale* has a high rate of dispersal (Holm et al, 1997). An herbaceous plant called *Chenopodium murale* may grow in a variety of soil types (Mitic et al. 2012). The plant can reach a height of 0.6 m and has a stem that is 3–10 cm long, frequently branched, hairy, especially on juvenile parts, and rarely thick (Anonymous 2017). The rhombic-ovate, irregular, hairy, and toothed leaves measure 1.5–9.0 cm in length and 0.8–5.0 cm in width. Flowers grow in a small, glomerule-dense cluster that resembles a cyme. The seeds have a diameter of 1.2-1.5 mm, are horizontal, and are black and dull (Mitic et al. 2012).

Allelochemicals from the common wheat weed *Chenopodium album* L. have the ability to be released into the soil and may have an impact on the germination and growth of nearby plants, either positively or negatively. It has been demonstrated that *C. album* has allelopathic effects on wheat (*T. aestivum*), resulting in lower germination rates and shorter shoot and root lengths (Daizy et al., 2006), radish (Malik et al., 1994), wheat and jute (Roy et al., 2006), and safflower (Rezaie & Yarnia, 2009). This study therefore plan to investigate the allelopathic effect of *C. murale* species on wheat plants.

MATERIALS AND METHODS

Chenopodium murale plants species were collected from Maharishi Markendeshwer (Deemed to be University) roadside populations that were organically expanding. The appropriate quantity of *Chenopodium* was collected, brought into the lab, and cleaned. The leaf was then removed from the twigs and washed once again with running water. After washing, use a weighing machine to calculate the weight of the leaves based on the development of the concentration. With the help of a mortar and pestle, leaves are crushed after being weighed. The plant material extract was mixed with distilled water and poured over muslin cloth. There are three concentration levels decided, 100%, 75%, and 50%. For a 100% concentration, mix 100g of *Chenopodium* leaves with 100ml of distilled water. For 75% and 50% concentration 75g and 50g leaves were grinds in100ml of distilled water respectively (El-Khatib and Abd-Elaah, 1998). To keep track of the many growth parameters of the test species, these extracts were used in bioassay. *Triticumaestivum* was the variety used for the test crops. The test species' seeds were purchased in the neighbourhood Mullana market. Test species seeds were surface

sterilised for 1-3 minutes with 1% sodium hypochlorite solution before being thoroughly washed with distilled water. Seed germination and radicle growth data: In 12 pots, three replicates of each concentration and one replicate of the control were used to measure the seed germination and radicle lengthening of the test species. Then, in every replication of the control and treatment, ten seeds of each test species were maintained. 10 ml of the bioassay extract were added to pots following the germination of test species seed at a laboratory room temperature of 25° to 30°c.

RESULTS

Different concentrations of extracts of *C. murale* reduced plant height, number of tillersat higher concentrations (Table 2). However, lower concentration (50%) had stimulatory effects on all these parameters as compared to initial set (Table 1). Maximum plant height (19.5 cm) were recorded in pots treated with 50% concentration and thereafter plant height decreased with increasing concentrations. Strong inhibitory effects on these parameters were observed at 100% concentration treatment where plants attained a height of 14.1 cm lengths. As compared to control, 50% concentrated extract stimulated plant height (Figure 1).

Figure 1: Effect of *Chenopodium* extract on wheat shoot (A) Initial growth, (B) 100% concentration, (C) 75% concentration, (D) 100% concentration and (E) control

Table 1: The growth of wheat plants before applying different concentrations of *C. murale* in the starting of experiment

S. No.	Set I			Set II			Set III		
	Pot 1	Pot 2	Pot 3	Pot 4	Pot 5	Pot 6	Pot 7	Pot 8	Pot 9
1	8.4	8.7	10.8	11.1	9	12.2	12.3	12	9.9
2	9.4	7.2	7.4	12.2	11	13	14.5	11.8	12.6
3	9.7	9.8	8.1	13.1	10.9	12.9	13.8	13.2	11.3
4	7.8	12.5	11.1	14	12.4	14.3	15.1	14.1	10.7
5	7.7	7.4	12.3	9.8	10.1	15	10.2	11.9	9.8
6	8.6	12.5	9.8	12	11.4	13	9.5	12.5	12

Table 2: The growth of wheat plants after 3-days of applying different concentrations of *C. murale*

S. No.	Set I Control			Set II Growth in 50% Conc. Cm.			Set III Growth in 75% Conc. Cm.			Set IV Growth in 100% Conc. Cm.		
	Pot 1	Pot 2	Pot 3	Pot 1	Pot 2	Pot 3	Pot 4	Pot 5	Pot 6	Pot 7	Pot 8	Pot 9
1	17.5	15.1	16.4	15.5	16.9	16	13.3	13.1	14.6	11.2	12.3	13.1
2	16.7	13	15.6	19.2	17.6	17.2	14.5	13.2	16	11.3	11.7	14
3	15.5	16.4	14.2	15.7	14.9	13.8	14.8	14.4	17.1	10.9	14.1	11.3
4	16.8	14.5	13.9	17.3	16.2	15.7	15.7	12.9	16.2	9	12.1	12.1
5	14.9	13.6	17.2	16.7	15.5	16.7	15	13.2	17.3	10.2	10.9	10
6	15	16.1	16.9	16.2	14.8	19.5	14.4	11	15	10.4	9.9	11

Effact on Roots after three days

The roots get start shrink after applying concentration. Maximum shrinkage found in 100% concentration, as compared to75% and 50% concentration. The roots in control set observed healthy and longer then concentrations applied roots (Figure 2).

Figure 2: Effect of *Chenopodium* extract on wheat root from left control, 50% concentration, 75% concentration and 100% concentration

DISCUSSION

The current study demonstrates that the fresh aqueous leaf extracts of *Chenopodium murale* had effects on wheat development and yield that were both stimulatory (at lower doses) and inhibitory (at higher concentrations). *C. murale* allelopathic activity may be connected to the phenolic and alkaloid chemicals found in its leaves. According to Malik et al. (1994), aqueous air-dried *Chenopodium album* extract hindered the germination and growth of wheat and radish plants. They extracted seven phenolic compounds from the test plant's shoots, and they determined that chlorogenic acid was the main phytotoxin. Similarly, *Lactuca sativa, Lycopersicon esculentum,* and *Allium cepa* were examined for their ability to germinate and flourish after Cutillo et al., 2003, discovered 7 cinnamic acid amides from *Chenopodium album*. They noticed that all of these plants had decreased germination and development. This study sought to understand the detrimental effects of *Chenopodium* extracts on wheat (*Triticumaestivum*) germination and growth.

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The Qualitative Estimation of Fungi Distributed in the Fruit and Vegetable Market

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ABSTRACT

Fungi are major components of the air and are approximately 10 times more than pollen grains in number. Exposed petri plate method was used to obtain qualitative estimation respectively. Concentration of fungal spore in a vegetable market environment was examined to collect basic information required for further studies. Most of the fungal samples were collected and isolated from main vegetable market of district Hapur in January, 2022 by visual and sticky slide methods. Alternaria sp. was found most dominant and Phytophthora sp. was the least dominant fungus found during present study. The study also showed a common representation of many fungi in vegetable market and as well as their occurrence in the vegetable crop fields near the vegetable market.

KEYWORDS: *Aualitative estimation, Fungal spores, Petri plate, Vegetable market, District Hapur*

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INTRODUCTION

Air pollutants are divided into two major heads i.e. gaseous & particulate pollutants. Granular tiny matter can be a prime reason of respiratory allergies and infections of related to respiratory system. Allergic sensitization of the intra-thoracic air tract (Asthma) or hypersensitive pneumonitis may be a great health issue and an important matter of long term. Microorganisms always present in the nature and they migrate through one place to another by air currents Singh et al., 2015a,b; Singh et al., 2016; Singh et al., 2017; Singh et al., 2018). Fungus is a common microorganism in the environment. Fruits and vegetables are the safest home for fungal growth and sporulation. Although, antimicrobial activities of fruits & vegetables have already been reported by earlier workers (Singh et al., 2021; Singh et al., 2022). There is always a scope available to find out something new so, present investigation was carried out by random sampling method. For present study fungal samples were collected from the vegetable market of district Hapur (U.P.). Fungal spore can grow at temperature as low as 2 to 4°C and can infect surrounding vegetables during storage. They often precipitate on the stored materials from the field, after which they can grow, sporulate and spread through batches of stored strains. Storage area may also become contaminated with airborne fungal spores. Microorganisms grow at optimum temperature 28+1°C but low temperature is not suitable for the growth of microorganism. Research of airborne fungal spores in atmosphere at tea gardens of a city of Bangladesh was published by Abdullah et al. (2019). Some fungal spores were also identified in the aeromycoflora of fruit and vegetable market at Bangalore (Nagadesi and Reddy, 2020).

MATERIAL AND METHODS

Experimental field work was done at vegetable market, Hapur (U.P.). The study area and sub stead area of Investigation are described below**.** Studies were carried out at Hapur, which is a part of the Indian gangetic plain lying at 28.72°N latitude and 77.78°E longitude about 200 meters above sea level. It receives about 30 inches annual rain fall and comes under a semiarid zone with extreme fluctuations in temperature. The main occupations of Hapur are agriculture and leather industry. The comprehensive survey of vegetable market was done and the samples of some selected vegetable fungal diseases were taken during January, 2022. 35 genera of different fungi belonging to 65 species were isolated by visual and sticky slide methods.

Sampling and Isolation Method

To collect samples of fungi from different locations sterilized petri plates containing sterile Rose Bengal Streptomycin and Sabouraud agar medium were exposed. Three petri plates per location were exposed for few minutes. The exposed petri plates were incubated in an inverted position at 27 °C for 5 to 7 days. Different colonies of fungus were identified by observing cotton blue -lacto-phenol stained one under 10x, 40x and 100 x of compound microscope.

Composition of Rose Bengal medium

Glucose	10.00g
Bacto peptone	2.00g
Potassium di hydrogen phosphate	0.50g
Magnesium sulphate	0.50g
Rose Bengal dye	0.05g
Bacto agar	20.00g
Distilled water	1000m
Penicillin Streptomycin	each pinches

Medium preparation

All constituents except agar were dissolved in 1000 ml distilled water. The agar was added to the medium and boiled in sterilized conical flask. Subsequently medium was sterilized by autoclaving at 15 lbs. steam pressure at 121.4°C temperature for 15-20 minutes. After cooling the medium to 45°C to 50°C crystalline streptomycin (40 mg/ litre) and rose bengal dye (50µg/litre) was added under aseptic conditions, that is inside laminar flow ambient which was already sterilized by HEPA filters and UV lights.

Identification of Airborne Micro Fungi

The fungi were identified by consulting the following literature Raper and Thom (1975); Gilman (1959); Subramanian (1971); Booth (1971); Ellis (1971, 1976); Nilsson (1983); Ellis and Ellis (1985); Kendrick (1990) and Smith (1990).

RESULTS AND DISCUSSION

The present research was carried out to elaborate the quality & quantum of aeromycoflora of vegetable market of distt. Hapur. Different fungi were also examined under microscope by visible method. The prime vegetables include potato, tomato, brinjal, onion, bhindi, chilli, cucumber, pea, arbi, coriander, torai, methi, beans, cowpea, carrot, mustard, papaya, radish, cauliflower & lemon. The observed data presented in Table 1, reveals that *Aspergillus niger* was isolated from nine types of vegetables and *Aspergillus flavipes, A. solani, A. porii, A. dauci, A. tenuis, Cercospora hinisci, Chaetomium globosum, Colletotrichum dematium, C. capsci, C. papayae, Curvularia geniculata, Cylindrocarphon radicicola, Dictyoarthrinium sp, Drechslera brassicola, Erysiphae polygoni, Fusarium avenaceum, F. solani, F. equiseti F. moniliforme, F. cocruleum, Macrophomina phaseoli, Phomopsis vexans, Parcilomyces varioti*, *Peronospora brassicae*, *Phytophthora colocasiae*, P. *infestans*, *Rhizoctonia solani*, *Sclerotium rolfsii*, *Trichothecium roscum*, *Uromyces fabae, Volutina sp.* were isolated from only one type of vegetable in January, 2022. Dominant fungi in decreasing order were, *Alternaria sp. =Aspergillus sp.>Fusarium sp.=Colletotrichum sp.>Drechslera sp.>Cercospora sp.=Curvularia sp.= Cladosporium sp.=Penicillium sp.=Phytophthora sp.* The microorganisms remain associated with fruits and vegetable (Kumar et al., 2022; Aggarwal et al., 2020). They fungi are responsible for physical and biochemical changes in the substrates (Singh et al., 2020; Singh et al., 2021; Singh et al., 2023). Similar findings were also published by Kalode and Dalal (2021).

Table 1: Qualitative distribution of fungi in main vegetable market, Garh Road, Hapur by visual method under microscope (January, 2022)

Name of Fungi	Potato	Tomato	Brinjal	Onion	Mustard	Chilli	Cucumber	Bhindi	Pea	Torai	Arbi	Beans	Carrot	Papaya	Cauliflower	Citrus
Alternariabrassicae	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-
A. brassicola	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
A. melongenae	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
A. alternata	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	-
A. solani	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A. porii	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
A. dauci	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
A. tenuis	-	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-
Aspergillus niger	+	-	-	+	-	-	+	-	-	+	-	+	-	+	-	-
A. flavus	-	+	-	-	-	+	-	-	-	-	-	+	-	+	-	-
A. fumigatus	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A. flavipes	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
A. nidulans	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-
A. terreus	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	-
A. versicolor	-	+	-	+	-	-	-	+	-	+	+	+	-	-	-	-
A. candidus	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Botryodiplodia theobromae	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-
Cercospora hibisci	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
C. spina	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-
Choanephora cucubitarum	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-

Name of Fungi	Potato	Tomato	Brinjal	Onion	Mustard	Chilli	Cucumber	Bhindi	Pea	Torai	Arbi	Beans	Carrot	Papaya	Cauliflower	Citrus
Chaetomium globosum	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Cladosporium herbarum	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
C. cladosprioides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colletotrichum dematium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. capsici	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-
C. lindmulthianum	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-
C. gloeosporioides	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
C. papayae	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Curvularia lunata	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-
C. geniculata	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Corynespora cassicola	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-
Cylindrocarphon redicicola	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Doratomyces spp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dictyoarthrinium spp	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Drechslera tetramera	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	-
D. brassicola	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
D. bicolor	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
D. spicifer	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Erysiphae polygoni	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Fusarium avenaceum	--	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. solani	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. equiseti	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
F. moniliforme	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-

Name of Fungi	Potato	Tomato	Brinjal	Onion	Mustard	Chilli	Cucumber	Bhindi	Pea	Torai	Arbi	Beans	Carrot	Papaya	Cauliflower	Citrus
F. cocruleum	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Geotrichum candidum	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Macrophomina phaseoli	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Myrothecium raridum	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Mucorspp	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Penicillium multiforme	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P. croyophilum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phomopsis vexans	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Paecilomyces varioti	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Peronospora brassicae	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Phytophthora colocasiae	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
P. infestans	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protomyces macrospora	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudoperonspora cubensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhizopus stolonifer	-	-	-	-	-	-	-	-	+	+	-	-	-	+	-	-
Rhizoctonia solani	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sclerotium rolfsii	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Syncephalast rumracemosus	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-
Trichothecium roseum	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Urocystis spp	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Uromycesfabae	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Volutina spp	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-

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Parthenium a Noxious Weed: A Review on the Allelopathic Impact on Crop Plants and Their Management

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ABSTRACT

Allelopathy is a chemical interaction between higher plants in which allelochemicals generated by donor plants can significantly alter – and in some cases, hinder – the development of recipient (test) plants. Allelopathy is thought to have a significant role in their fast spread. This is particularly true of invasive alien species (IAS) such as Ambrosia artemisiifolia and Sorghum halepense. Only a few weed species are known to have an allelopathic inhibitory effect among these dominant weeds. Parthenium hysterophorus L. is world's worst weed. Although it originated in tropical America, it has now spread quickly to Asia, Africa, Australia, and Europe. It can be controlled by herbicides, but their use adversely affects the environment and human health. It has been shown that extracts, residues and essential oils of many allelopathic plant species effectively control the germination and growth of Parthenium.

KEYWORDS: *Allelopathy, Parthenium hysterophorus, weed, inhibitory, environment, human health*

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INTRODUCTION

The weed *Parthenium* is seen as a crop, grazing, and environmental hazard. It has spread to almost 40 nations (Bajwa 2018). The central highlands of Queensland, Australia, contain 8.2 million ha of *Parthenium* weed infestation, with isolated infestations also present in the state's northern and eastern regions. In India, *Parthenium* weed has grown to be a significant issue in every State, from which it has spread to nearby nations via cars or as a contaminant of seeds that have been transported. Additionally, this weed brutally devastates the pasture and agricultural plains of Eastern African Nations, with Ethiopia seeing the worst infestation (Adkins et al., 2014). *Parthenium hysterophorous* L. is one of the ten most dangerous weeds on the planet. It has spread widely throughout Pakistan's Punjab and Khyber Pakhtunkhwa provinces. In an endeavour to find alternatives to chemical herbicides for weed management, *Parthenium* has risen to become the 7th most destructive weed in Asia, Africa, and Australia.

It's thought to have arrived in the Indo-Pak subcontinent via North America (Kaur et al., 2014). *Parthenium hysterophorus* L. belong to Asteraceae; family is an annual or short- lived perennial herbaceous plant (Adkins et al., 2011) that invades disturbed locations, damages natural ecosystems, and can cause major allergic reactions in humans and livestock (Lonkar et al., 1974; Chippendale and Panetta, 1994) and is a major issue in rangelands, agriculture, and forestry (Tamado et al., 2002; Nath et al., 1981). It spread too many more part of the world, and it causes annual ecological and agricultural losses in large amounts. Its widespread spread has been reported in Pakistan's Khyber Pakhtunkhwa and Punjab provinces. It is responsible for severe health issues in humans, causing bronchitis, hay fever, dermatitis, and asthma. Pollens of this weed cause asthma, while contact of a body part with this weed causes dermatitis. Parthenin, ambrosi, tetraneuris, and coronopilin are the common allergens located in different places of this weed (Kaur et al., 2014).

WEED AND CROP PRODUCTION

Weeds and crop plants are spatially adjacent. They deny crop plants of the limited nutrients, space, light, and moisture available to them. As a result, the physiological activities and growth of crops are harmed when weeds are present (Rajcan and Swanton, 2001). Due to weed-crop competition, reduced crop output is the endresult. Crop plants are affected indirectly by weeds. Allelopathic interaction by specific weed species has an impact on crop development. Allelochemicals from allelopathic weeds can harm budding crop seedlings by disrupting root and shoot growth, among other things.

CHALLENGES IN WEED MANAGEMENT

Weed management has become even more vital and difficult as the world's population grows and resources become scarce. In order to ensure food security around the world, precise weed control is required. Herbicide application, mechanical weeding, and hand weeding are currently the most effective weed control methods. However, the long-term viability of chemical weed management faces some difficulties. The emergence of herbicide resistance in weeds is the most significant of these concerns. The harmful effects of herbicides on the environment, human, and animal health are also issues in weed management with herbicides (Chauhan, 2020).

ORIGINS AND SPREAD

According to Navie et al, 1996 *Parthenium* weed is native to the Gulf of Mexico region, which encompasses southern Brazil, northern Argentina, and southern Bolivia in addition to the southern United States of America (Dale et al., 1981). The growth of *Parthenium* weed is an erect and having branching annual as short lived perennial. Plants can grow to be 2.5 meters tall when fully mature, however most individuals are only 1.5 meters tall. The leaves are hairy and divided into a series of thin lobes. On the stem tips, the little white blooms (4 mm diameter) consist of five distinct ray florets (rarely six, seven, or eight).A typical bloom comprises two sterile florets attached laterally to 4 or 5, blackish achene's (Two millimeter diameter) inside of a straw-colored fruit layer. The quick germination and fast growth of the plant (Nguyen et al., 2011), as well as its allelopathic nature, enable it restrict nearby vegetation (Navie et al., 1998), allow it to develop vigorously and, as a result, produce a large quantity of seeds, and expending to its soil seed bank (Belgeri et al., 2012).

The *Parthenium* weed germinates in the spring, produces blooms and seed throughout its life cycle, and dies in the late autumn (Figure 1). It can begin flowering as early as one month after planting and will continue to flower for another 6–8 months. *Parthenium* weed can germinate, grow, and flower in a wide variety of temperatures and photoperiod conditions; hence it can be found growing in the field at any time of year in its introduced range. On the other side, summer is the most crucial season for development because it is warm and has more frequent and abundant rainfall. Most plants die during harsh winters because their aerial portions cannot withstand frost, however certain plants can recover from mild winters and old stem bases by growing from their roots. In Australia, regions with more than 500 mm of

annual summer rainfall are the most favorable for *Parthenium* weed. (Navie et al., 1996**)**. The weed prefers dark, alkaline, crumbling clay soils with high fertility levels, and these conditions are ideal for it to grow. It can also be found in a variety of soil types, such as clay loams and sand loams in naturally disturbed areas with limited vegetation, such as wastelands, plains that have been cleared, and grazed pastures, parthenium weed thrives. (Navie, 1996).

SEED BIOLOGY, GERMINATION AND LONGEVITY

In the conditions all right, flowering start anywhere between 28 to 42 days after seedlings emerge. As a result, it can occur at any time of the year. (Navie et al., 1996). For *Parthenium* weed seed germination, the optimal day/night temperature range was 21/16^{0}C. Additionally, Navneet et al., 2010 found that although both populations studied germinated throughout a wide range of temperatures, the two Australian biotypes' ideal single temperature for germination was between 22 and 25 degrees. According to the same authors, 70% of seed buried at a depth of 5 cm underground would survive for at least two years under field conditions, with a half-life of seven years. This was in line with Dhileepan and McFadyen's 2012 discovery that Parthenium weed seeds might survive for four to six years in the soil seed bank. According to additional studies, buried seeds survive much longer than seeds that are exposed to the soil's surface (Navie et al., 1998).

ALLOPATHIC INTERFERENCE AND TOXICITY

Strong allelopathic tendencies of the *Parthenium* weed have been theorized as a factor in the invasion and persistence of this weed in a range of native and non-native populations. (Kanchan, 1980). The leaves and roots of *Parthenium* weed, which are aerial portions, contain a number of possible allelochemicals. (Table)1. The emergence and development of several plant species, including native plants, crops, and pasture species, have been shown to be hampered by these compounds. *Parthenium* weed remnants have reportedly caused harm to a variety of significant field, horticultural, vegetable, and agroforestry crops. Therefore, more research should focus on identifying and measuring the distinct suppressive elements in order to evaluate the suppressive properties of various weeds, not simply suppressing.

Table 1: Allelochemicals that may exist have been found in several *Parthenium* weed plant sections.

Sr. No	Chemical Family	Chemical Constituent	Plant Parts	References
1.	Sesquiterpene lactones	Cumeric acid and Parthenin	Stem, leaves and pollen grains	Kanchan, 1980
2.	Phenolic acids	Fumaric acid and anicic acid	Leaves and Roots	Valliappan and Towers, 1988
3.	Sesquiterpenes lactones	Coronopilin	Flowers, Stem and trichomes.	Picman and Picman, 1984
4.	Minor sesquiterpene	Ambrosonalides and 2B-hydroxycoronopilin	Flower	Sethi et al., 1987
5.	Sesquiterpene lactones	Pseudoguananolides	Leaves and Stem	De la Fuente et al., 2000
6.	Sesquiterpenes lactones	Hystrin	Stem	De Vivar et al., 1990
7.	Flavonoids	Aglyconeflavanols	Aerial parts	Shen et al., 1976

IMPACTS OF *PARTHENIUM* ON AGRICULTURE

The *Parthenium* weed has significant unintended consequences on agricultural output. Local sale of pasture and agricultural seed lots may be hampered by *Parthenium* weed seed contamination. (Chippendale and Panetta, 1994). By acting as a secondary host to several significant crop pests and diseases, *Parthenium* weed can unintentionally lower crop output. The common hairy caterpillar (Diacrisiaobliqua Walk), Xanthomonas campestris, phaseoli, and tobacco stripe virus are pests that are significant economically. (Sharman et al., 2009).

Parthenium hysterophorus invades disturbed areas vigorously and severely harms meadows and crops. Due to the weed's reduction of the activities of the nitrifying and nitrogen-fixing bacteria Rhizobium, Actinomycetes, Azotobactor, and Azospirillum, nodulation in legumes is affected. Many viral infections that affect crop plants employ the weed as a secondary host. It also acts as a different host for the mealy bug insect. *P. hysterophorus* suppresses yield in infested sorghum, it causes the sale and transit of these produce to be limited (Jamil et al., 2021).

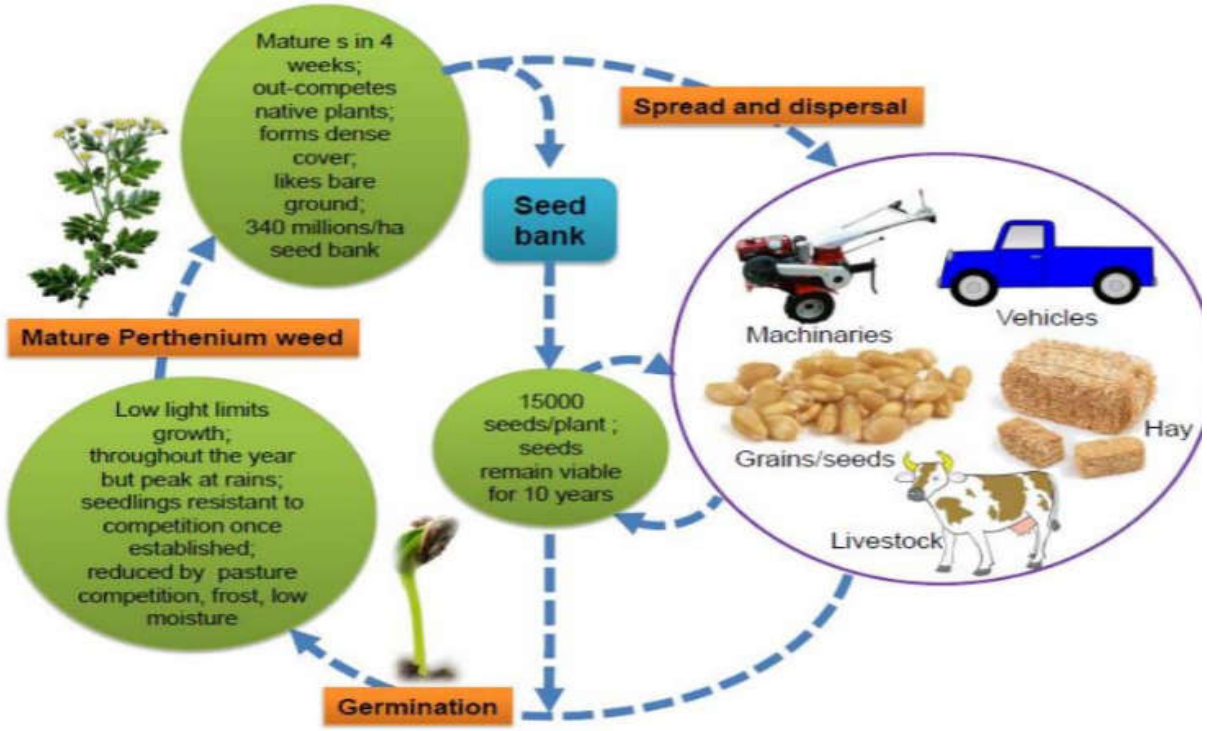

Figure 1: The seed dispersal and life cycle of *Parthenium hysterophorus* (Masum et al., 2013)

INTEGRATED WEED MANAGEMENT

The best strategy for long-term *Parthenium* weed control is integrated weed management, which combines all viable management options. A more efficient integrated approach is required, since *Parthenium* weed can withstand independently applied management strategies in many locations (Tabe Ojong, et al., 2022). These integrated weed control kits must be effective at killing weeds, economical, simple to use, and ecologically safe. One element of a comprehensive *Parthenium* weed management strategy is the incorporation of suppressive plants with biological control agents. The *Parthenium* weed has not yet been extensively eliminated using this strategy (Chacko et al., 2021).

CULTURAL MANAGEMENT

Parthenium weed is an established weed in all States and Territories of Australia, and landowners are required to control it and/or report it to the appropriate State authorities if it is discovered. The *Parthenium* weed has been classified as a class 2 weed in Queensland, which indicates that it is a widespread weed that can have detrimental effects on the economy, the environment, and society. *Parthenium* weed is a noxious weed in New South Wales, and landowners must notify local government control authorities of its existence three days after they spot it. *Parthenium* weed has been designated as noxious in South Australia, Tasmania, Western Australia, and the Northern Territory; it is a prohibited weed in Victoria. (Bashar et al., 2021).

PHYSICAL MANAGEMENT

Due to the scale of the weed infestations and the high cost of labour in some nations, physical *Parthenium* weed removal is not viewed as a cost-effective solution in Australia, where all States have classified the plant as a weed. In addition, it induce contact dermatitis and asthma, this management strategy may have an adverse effect on the health of the personnel hired to undertake this activity **(**Bashar et al., 2021). Additionally, populations of *Parthenium* weed quickly repopulate after human removal and will grow from clipped or partially removed plants that still have roots. In developing nations, where labour is scarce, hand pulling and hoeing techniques are frequently used (Rao et al., 1979).

CONCLUSION

Allelopathy is a difficult problem because various mechanisms co-occur and interact in natural systems. Therefore, more research should focus on isolating and quantifying the distinct suppressive components in order to evaluate the suppressive capacities of many weeds, not just those that suppress *Parthenium*. For instance, while shade is commonly cited as one of the main suppressive variables, its contribution should be properly defined. Since this weed is very effective in nature and has more suppressing power, we believe that special attention should also be made to the distinction between resource competition and allelopathy. This weed can be utilized easily for weed management or for weed suppression.

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Plant and Animal Cell Systems in Cancer Biology

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ABSTRACT

Cancer biology is a broad area of study, and a lot of emphasis has been placed on drug design. The development of functional drug compounds relies on the outcome of cell responsive studies that involve animal cells, the cancer, as well as, compounds from plants. The variability in the response of cancer to plant compounds is important in order to understand the mechanisms involved in cancer metastasis and progression in animal hosts. This theme will form the basis of this contribution.

KEYWORDS: *Tea, Fruits, Cocoa, Polyphenols, Caffeic acid, Tumeric, Naturally-derived compounds, G2 / M.*

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Plants have been used for centuries to treat cancer, and their effect on animal cells differs depending on the method used to prepare them. This means that heating and cooling of the extracts made from plants can either cause cancer cells to grow or die in animal systems. In all life forms, the general hereditary information, that's retained in the nucleus, controls mitosis and meiotic divisions (Singh and Reddy, 2012). However, plant extracts, sometimes referred to as fractions - as indicated by Singh (2016) - has the ability to dictate what happens within the cytoplasm. Therefore, in order to mitigate the entry of the compound into the cell, a highly regulated sequence of events is required, and this involves the movement of the spindle fibres in somatic cells (Singh, 2016). Plants are essential for all life forms, not because of their ability to provide natural resources, but more importantly to sustain the economy and the food chain. Animal cell systems require a fairly adequate amount of nutrients to retain the robustness of animal activities (Singh, 2014). This simply implies that once cells have depleted of nutrients, their unhealthy nature is able to contribute toward the spread of cancer (Singh, 2020). In plants, chlorosis, a process that results in depigmentation of the plant, is a type of plant cancer which is a result of abnormally operational chloroplasts. In animal systems, the capability to rescue healthy respiring cells become very difficult, depending on how far the cancer has developed (Singh, 201). Currently, the plant belonging to traditional therapies in China, Japan, India, Africa, Pakistan, Sri Lanka and Thailand are used in in vitro cancer studies, particularly to evaluate their efficacy against cancer cell responses (Singh, 2014). Iron and calcium is required to maintain the integrity and shape of animal cells, however, it has been found to also increase the proliferation of adenocarcinoma (Wu et al., 1999). This relates to

cancer cell using ordinary nutients to grow inside animal's lungs, since the iron in the blood supplies the blood capilaries of the alveolus in animals (Wu et al. 1999). The basic structure of an animal cell tells us that the sphingomyelin, which is found in the outer-leaflet of mammalian cells, contribute toward signal transduction events, viz. apoptosis and autophagy, and this, in turn may contribute toward different cellular responses to plant compounds. This statement is backed up by the fact that sphingomyelin has a dual role as a stimulant and inhibitor of cell cycle events, because the secretory role of phospho sphingomyelin has been found to secret chemokines, immune protectors, serotonin and other therapeutic compounds (Singh, 2012). Singh (2014) has suggested that a pivitol factor required assessing the proliferation of cancer cells in favourable environments, have always been a way to prevent missing out any details. These details are aspects that affect both animal and plant cell systems and are not just limited to ceramide, reactive oxygen species, secondary metabolites and cellular responses. This implies that although a concerted and concrete emphasis is placed on arresting cancer cell growth, a lot of effort is placed on natural products, as they are able to prevent the multiplication of mutational cells - cancer - and can essentially contribute toward the healthy progression of animal life (Singh, 2017). In nature, taxol, camptothecin and doxorubicin, are the naturally-derived compounds that are used to prevent the cells from entering into G2 phase of mitosis (Hoaren and DaSilva, 1992). These compounds interfere with the polymerase enzymes at the replication folk, and thereby prevent uncontrolled proliferation of the cancer cells. It is because of this major feature that the G2 / M is a major checkpoint in cell cycle control. Furthermore, since G2 / M prevent cells from entering mitosis, it is said that G2 / M conseration is not a beneficual strategy for drug development (Murray, 1993). This is because although fission of healthy eukaryote cells is possible, the cancer would further compromise animal health. It has been found that Bid, Bax and Caspases contribute immensely toward apoptotic cell death, whereas Survivin and Arora B kinase don't inhibit cell death, but rather is pivitol in mitotic catastrophy events. Survivin, Arora B kinase, Mad and Bab are said to aid spindle formation, and as a result promotes the development of cancers in animals (Singh, 2014). A remarkable deduction, however, is that mitotic catastrophy has the ability to enhance fully functional apoptosis, or to resemnle the features of apoptosis (Singh, 2012). Some of these features are the ruffling of the plasma membrane, nuclear fragmentation, cytoplasmic blebbing, chromosome degradation, spindle fibres misalignment, amongst others (Singh, 2014). Plant polyphenols, curcumin and the extracts of Bulbine natalensis are found to induce fluctuation cellular responses, while plant toxins induce proliferative responses in colon, laryngeal and breast cancer cells. This feature of cancer cells is due to them containing resistant genes to specific compounds present in the toxins (Lee et al., 2004). The animal system is sustained by the phases of cell division, viz. Interphase, anaphase, metaphase, prophase and telophase. Whether a plant compound is prepared from the vegal source or not, like with Braccharis drucunculifolia, the compound administed affects the rate of cell multiplication, because of the stimulatory and inhibitory substances like caffeic acid and cinnamic acid (Fukuda et al., 2006). With the same plant, Baffalo and coworkers (2010) reported that the propolis extracts were highly effective in inhibiting cancer growth with a much lesser amount in comparison to the fraction from the vegetal source. In mice, the polyphenols in tea show lung cancer inhibition, whereas it enhances cancer cell proliferation. This means that drug development has considered inconsistencies prevalent in cell viability studies. In a study conducted by Calvert and coworkers (2005), the relationship of concentration independence and time dependence of cancer cells to plant compounds was evident. According to Singh and Reddy (2012), the HEp-2 cell line presents difficulties in analysing selective toxicity from the feature of these cells being robust but resistant. This attribute is ascribed to HEp-2 being unable to undergo autocrine apoptosis upon growth medium chemical depletion (Singh, 2014). Reactive oxygen species, however, hinders cancer cell proliferation, by interfering with cytoskeletal proteins (Singh, 2017). Thus, drugs that target myosin are essential to inhibit cancer cell growth

in mammalian systems (Singh, 2014). Plant polyphenols, as mentioned, affects apoptosis in the intestine, kidney and liver. Some examples are the curcumin obtained from tumeric, curry ans mustard, as well as, the procyandin obtained from apple, cranberry, grape, peach, pear, plums, as well as cider, cocoa and wine (Gu et al., 2003). In some animal cell systems, methylation, glucuronidation and sulfonation occur in order to utilise the polyphenolic, because cellular respiration with type 1 metabolism gets problematic. In some plant extracts, the reactive oxygen species scavengers, protect cancer cells by maintaining a high Bcl-2/Bax protein ratio, while increasing PARP (Poly -(ADP-ribose)-Polymerase expression and reducing DNA fragmentation (Singh, 2014). It can be concluded that the interplay of the genes involved in apoptotuc/autophagy with Survivin are of great therapeutic importance, particularly because of the presence of these scavengers in plant material, as well as, the dual role of Survivin (Singh, 2020; Singh, 2018).

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