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Evaluating the Allelopathic Efficiency of the Seed Powder of *Raphanus Sativus* L. in Controlling Some Weeds Associating *Phaseolus Vulgaris* L.

By Ahmed, S.A.A.; R.R. El-Masry, Nadia K. Messiha & Kowther G. El-Rokiek

Abstract- Two pot experiments were conducted in the greenhouse of the National Research Centre, Dokki, Giza, Egypt, in the two successive seasons of 2016 and 2017 to study the allelopathic potentiality of *Raphanus sativus* seed powder (Rssp) on *Phaseolus vulgaris* growth, green and dry yield as well as its effect on the growth of associated weeds *i.e., Corchorus olitorius*, *Abelmoschus esculentus* and *Portulaca oleracea.* Treatments were applied by the incorporation of *R. sativus* seed powder (Rssp) to the soil at (0. 15, 30, 45 and 60 g/kg soil). The results indicated a significant reduction in the dry weight of *C. olitorius*, *P. oleracea* and *A. esculentus* in comparison to their corresponding untreated control. The phytotoxic effects of (RSSP) on the three weeds dry weight reached its maximum effect (100%) at 60g / kg soil. The results also indicated that all growth parameters of *P. vulgaris* as well as green and dry yield were significantly increased by different (Rssp) concentrations at the two ages of growth (40 DAS and at harvest) as compared to the corresponding untreated controls. (Rssp) at 30 g/kg soil recorded the highest values as compared to their corresponding controls. The presence of glucosinolates and Phenolic compounds in (Rssp) play an important role in its natural selective bioherbicidal properties in controlling the three weeds associating *P. vulgaris* plants.

Keywords: corchorus olitorius, abelmoschus esculentus, portulaca oleracea, common bean, allelopathy, raphanus sativus, glucosinolates content, phenolic content.

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Ahmed, S.A.A. [α]; R.R. El-Masry [σ], Nadia K. Messiha [ρ] & Kowther G. El-Rokiek [ω]

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I. Introduction

Phaseolus vulgaris is one of the major grain legumes mostly grown in the world as a source of proteins for the human. Like many other grain legumes and crop plants, weeds grown associating these crop plants caused high percentage of yield loss (El-Rokiek *et al*., 2013 and 2016 and Ahmed *et al*., 2014). Due to the competition of weeds for nutrients, water, light, etc. different herbicides were used for weed control to decrease its competition and consequently increase the crop yield (Abdelhamid and El-Metwally, 2008 and El-Rokiek *et al*., 2013).

However, the continuous use of herbicides caused problems because of environmental, toxicological or economic purposes associated with their use (Duke *et al.,* 1999). So, the need for alternative natural herbicides becomes important to reduce the continuous use of synthetic herbicides and for the development of safer, alternative crop protectants (Mahmood and Cheema, 2004). Many crop, trees and weed species have been reported to possess allelopathic activity on the growth of other plant species (Jabran *et al.,* 2010). Allelopathic substances (secondary plant metabolites) are present in many plant tissues e.g., leaves, stems, flowers, fruits, seeds and roots (Mahmood *et al*., 2010 and Ahmed *et al*., 2014). Allelochemicals are released to the environment from plants through degradation, volatilization, leaching from plant leaves, and from root exudation (Petersen *et al*., 2001 and Price *et al*., 2005).

The allelopathic potentiality of Brassicaceae plants in suppressing the growth of different types of weeds (annual, perennial and parasitic) have been recently reported from the Botany department of the National Research Centre of Egypt (Messiha *et al.* 2013& 2018; Ahmed *et al.*2014& 2016; El-Masry *et al.* 2015 and El-Rokiek *et al.* 2017).

Brassicaceae plant tissues are known to contain considerable amounts of glucosinolates in their tissues which could be easily hydrolyzed in the soil to phytotoxic products such as isothiocyanates, nitriles, thiocyanates, epithionitriles and oxazolidines (Bones and Rossiter 2006). Isothiocyanates is the main phytotoxic product (Fahey *et al*., 2001; Zaji and Majd, 2011 and Martinez-Ballesta *et al*., 2013) and have distinct pesticidal activities (Velasco *et al*., 2008).

The aim of the present work is to continue our strategy to evaluate the allelopathic efficiency of another member in the Brassicaceae family (*Raphanus sativus*) in controlling weeds associating *Phaseolus vulgaris* plants.

II. Materials And Methods

Two pot experiments were carried out during two successive seasons of (2016) and (2017) in the greenhouse of the National Research Centre, Dokki, Giza, Egypt. Common bean (*Phaseolus vulgaris*) cv.Giza 4 seeds as well as seeds of Radish (*Raphanus sativus)*, Jew's mallow(*Corchorus olitorius*), Okra (*Abelmoschus esculentus*) and Purslane (*Portulaca oleracea*) were obtained from Agriculture Research Centre, Giza, Egypt.

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Clean seeds of *R. sativus* were ground to a fine powder after that the powder was immediately incorporated in the soil surface before sowing *P. vulgaris* seeds at rate of 0. 15, 30, 45 and 60 g/kg soil. In the same time, the seeds of *P. vulgaris, C. olitorius*, *A. esculentus* and *P. oleracea* were sown 2cm deep in plastic pots filled with 2kg of soil. The experiment consisted of 18 treatments including control; each treatment consisted of 8 replicates. All pots were distributed in a complete randomized design. The normal cultural practices of growing *P. vulgaris* plants were followed especially fertilization and irrigation.

a) Characters studied

Weeds

Three replicates were collected from each treatment at 40 days after sowing (DAS) and at harvest. The dry weight of each weed species was recorded (g /pot) at the two growth ages and the percentage of reduction was calculated as compared to control.

b) Phaseolus vulgaris plants

Plant growth

Samples of *P. vulgaris* plants at 40DAS and at harvest were collected from each treatment to determine: plant height (cm), number of leaves/plant and dry weight of plant (g).

c) Yield and yield components

At harvest, samples of *P. vulgaris*plants were taken from each treatment to determine: A- Green yield, i.e. number of pods/plant, and weight of pods/plant (g) B- Dry yield, i.e. number of pods/plant, weight of seeds/plod (g), weight of 100 seeds (g) and weight of seeds/plant (g).

d) Chemical analysis

Total glucosinolates (µ mol/g DW)

Total glucosinolates were extracted from dry samples of seed powder of *R. sativus*. Glucosinolates were measured by determining the liberated glucose which released during hydrolysis by myrosinase enzyme *(Rauchberger et al., 1979).* The resulting glucose was determined colorimetrically according to the methods defined by *Nasirullah and Krishnamurthy (1996).*

e) Total phenolic contents (mg/g DW)

Total phenolic contents of *R. sativus* seeds were determined colorimetrically using Folin and Ciocalteu phenol reagent according to the method defined by *Snell and Snell (1953).*

f) Statistical analysis

All data were statistically analyzed according to *Snedecor and Cochran (1980)* and the treatment means were compared by using LSD at 5% probability.

III. Results

a) Weeds growth parameters

The results in Table (1) showed the effect of incorporating different rates from the seed powder of *Raphanus sativus* (0. 15, 30, 45 and 60 g per pot) on the dry weight of the three different weeds, i.e. *Corchorus olitorius*, *Abelmoschus esculentus* as well as *Portulaca oleracea* associating the growth of *Phaseolus vulgaris* after 40 DAS and at harvest. The results show that the competition between *P. vulgaris* and each weed caused a significant decrease in the dry weight of weeds after 40 DAS and lasted till harvest. It is worthy to mention that incorporating the seed powder of *R. sativus* at the rate of 30g/kg soil showed its bioherbicidal efficiency in controlling the different three weeds which reached more than 90% control. Higher amounts of (RSSP) also showed a higher bioherbicidal effect which reached to 100% of the three weeds with the highest rate (60g/kg soil).

b) Phaseolus vulgaris growth

The results in Table (2) indicated the effect of incorporating different amountsof the seed powder of *R. sativus* on different growth parameters of *P. vulgaris* as Plant height (cm), No. of leaves/plant and Dry weight of plant (g) at 40 DAS and at harvest. The results indicated that all growth parameters of *P. vulgaris* were significantly increased by different concentrations of*R. sativus* seed powder (Rssp). Not only, all treatments of Rsspconcentrations (15 to 60 g/kg soil) alleviated the harmful effect of the three weeds (*C. olitorius*, *A. esculentus* and *P. oleracea*) associating *P. vulgaris* plants, but also induced significant increase in all *P. vulgaris* growth parameters at the two ages of growth (40 DAS and at harvest) as compared to the corresponding untreated controls. The maximum increase in all *P. vulgaris* growth parameters at 40 DAS and at harvest was recorded with 30g/kg soil Rssp concentration when compared to corresponding controls. The increase in the dry weight of *P. vulgaris* associated with *C. olitorius* or *A. esculentus* or *P. oleracea* at 40 DAS reached to about 10.0, 15,7 and 4.8 %, while at harvest were about 22.6, 31.4 and 16.2 %, respectively over the dry weight of *P. vulgaris* free from weeds as shown from the results in Table (2).

c) Phaseolus vulgaris yield

A- Green yield

The results of the green yield of *P. vulgaris* associated with *C. olitorius* or *A. esculentus* or *P. oleracea* recorded in Table (3) cleared that different concentrations of Rssp (15 to 60 g/kg soil) induced a significant increase in the number of green pods/plant and weight of pods/plant of *P. vulgaris* when compared to their corresponding controls. Maximum increase in number and weight of green pods/plant of *P. vulgaris*

was recorded with 30 g/kg soil Rssp treatment as compared to their corresponding controls. Not only this treatment (RSSP at 30 g/kg soil) alleviated the reduction caused by the effect of *C. olitorius* or *A. esculentus* or *P. oleracea* on the weight of green pods/plant that reached to about 72.2, 68.3 and 74.8%, respectively, but also increased this character to about 7.6, 9.9 and 3.7%, respectively over their corresponding healthy control.

B- Dry yield

Dry yield and yield components of *P. vulgaris* associated with *C. olitorius* or *A. esculentus* or *P. oleracea* cleared that all Rssp concentrations (15 to 60 g/kg soil) induced significant increase in the different yield parameters (number of dry pods/plant, weight of seeds/plod, weight of 100 seeds as well as weight of seeds/plant) as compared to corresponding untreated controls (Table 3).The best treatment was recorded with 30g/kg soil Rssp concentration that achieved the highest increase in all *P. vulgaris* plant yield parameters. The increase in weight of seeds/plant of *P. vulgaris* associated with *C. olitorius* or *A. esculentus* or *P. oleracea* reached to about 25.9, 29.4 and 19.6 %, respectively over their corresponding control free from weeds.

IV. Discussion

The allelopathic compounds (allelochemicals) released from plants into the environment, as a result of secondary metabolites, include a variety of compounds, often attract or repel, nourish or poison to other organisms. Allelochemicals like phenolic compounds, flavonoids, terpenoids, alkaloids, amino acids and glucosinolates were found in allelopathic plants *(Fahey et al., 2001; Velasco et al., 2008 and Ahmed et al., 2012)*.

Recently, several researches showed the potentiality of using the allelopathic technique as a component of integrated weed management as bioherbicide to suppress weeds in crops *(Zaji and Majd, 2011; Ahmed et al., 2012, 2016; Messiha et al., 2013 & 2018; El-Masry et al., 2015 and El-Rokiek et al., 2017)*. Also, weed management systems seek biological solutions to minimize the harmful effects resulted from the use of herbicides in agricultural systems. Therefore, allelochemicals could be considered as an important tool for sustainableweed control management *(El-Metwally et al., 2014 and El-Wakeel, 2015)*.

The results of the present investigation reveal to a great extent a significant reduction in the three weeds, i.e. *Corchorus olitorius*, *Abelmoschus esculentus* and *Portulaca oleracea*growth after the incorporation of (Rssp) to the soil till 40 (DAS). Complete reduction of all weeds recorded by the higher concentration (60g/kg soil) of (Rssp) at harvest (Table 1). The previous results showed that Brassicaceae family has allelopathic potential on the growth of other plants *(Petersen et al., 2001; Messiha et al., 2013 & 2018; Ahmed et al., 2014 & 2016; Bashen, 2014 and El-Masry et al., 2015)*. In this connection, it is worthy to mention that the allelopathic effects of Brassicaceae plants were attributed to its natural allelochemicals mainly glucosinolates and phenolic compounds (Table 4). Glucosinolates hydrolyzed by endogenous enzyme myrosinase to a number of products. The main breakdown products are isothiocyanates, which are phytotoxic and achieved good results in controlling weeds *(Zaji and Majd, 2011; Martinez-Ballesta et al., 2013; Messiha et al., 2013 & 2018; Ahmed et al., 2014, & 2016; El-Masry et al., 2015 and El-Rokiek et al., 2017)*. Moreover, *Petersen et al., 2001 and Uremis et al., 2009* reported that the allelopathic effect of *Raphanus sativus L.* could also be due to the presence of p-hydroxy benzoic acid in addition to is othiocyanates.

On the other side (Rssp) treatments not only achieved to great extent good results in controlling the three weeds, i.e. *C. olitorius*(C_3 plant), *A. esculentus* (C_3 plant) and *P. oleracea* (C_4plant) but also increased *P. vulgaris* growth (Table 2) and consequently improved its green and dry yield (Table 3). Several workers found that the inhibition of weed growth increased the competitive ability of the crop plant and consequently improved growth and yield *(Abdelhamid and El-Metwally, 2008; Ahmed et al., 2012 & 2014; El-Rokiek et al., 2013 and El-Masry et al., 2015)*.

It is worthy to mention that (Rssp) at 30g/kg soil was the best treatment in controlling the three weeds (*C. olitorius*, *A. esculentus* and *P. oleracea*) and consequently increased the growth and yield of *P. vulgaris* as compared to corresponding controls, this may be due to the selectivity of allelochemicals in their action and plants in their responses *(Einhellig, 1995)*. Allelochemicals which inhibit the growth of some species at certain concentrations may stimulate the growth of same or different species at different concentrations *(Ahmed et al., 2012 & 2014; Messiha et al., 2013 & 2018 and Bashen, 2014)*.

The results of the present work indicate clearly the possibility of using allelopathic activity of *Raphanus sativus* seed powder as a selective bioherbicide for controlling annual weeds.

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Table (1): Effect of incorporating different concentrationsof the seed powder of *Raphanus sativus* on dry weight of *Corchorus olitorius*, *Hibiscus esculentus* as well as *Portulaca oleracea* (g/pot). (Combined analysis of the two seasons).

Treatments		At 40 days after sowing		At harvest	
Plants	Concentrationsof *Raphanus sativus* (g/kg soil)	Dry weight of weed (g/pot)	% of reduction	Dry weight of weed (g/pot)	% of reduction
Corchorus olitorius	……	11.96	00.0	22.85	00.0
Corchorus olitorius + *Phaseolus vulgaris*	……	7.45	37.7	19.34	15.4
Corchorus olitorius + *Phaseolus vulgaris*	15 g	2.41	79.8	3.62	84.2
	30 g	1.63	86.4	1.95	91.5
	45 g	0.82	93.1	1.10	95.2
	60 g	0.43	96.4	0.00	100
Abelmoschus esculentus	……	13.42	00.0	25.16	00.0
Abelmoschus esculentus + *Phaseolus vulgaris*	……	9.69	27.8	21.04	16.4
Hibiscus esculentus + *Phaseolus vulgaris*	15 g	3.62	73.0	4.15	83.5
	30 g	1.91	85.8	2.27	91.0
	45 g	0.90	93.3	1.41	94.4
	60 g	0.62	95.4	0.00	100
Portulaca oleracea	…….	16.54	00.0	29.40	00.0
Portulaca oleracea + *Phaseolus vulgaris*	……	12.37	25.2	24.90	15.3
Portulaca oleracea + *Phaseolus vulgaris*	15 g	3.95	76.1	8.30	71.8
	30 g	2.06	87.5	6.50	77.9
	45 g	1.08	93.5	1.82	93.8
	60 g	0.86	94.8	0.00	100
LSD at 5%		0.78		1.21	

Table (2): Effect of incorporating different concentrationsof the seed powder of *Raphanus sativus* on different growth parameters of *Phaseolus vulgaris.*(Combined analysis of the two seasons).

Treatments		Growth parameters					
		At 40 days after sowing			At harvest		
Plants	Concentrationsof *Raphanus sativus* (g/kg soil)	Plant height (cm)	No. of leaves/ plant	Dry weight of plant (g)	Plant height (cm)	No. of leaves/p lant	Dry weight of plant (g)
Phaseolus vulgaris only	…….	33.2	6.2	2.10	42.5	11.0	4.21
Phaseolus vulgaris+Corchorus olitorius	…….	24.0	3.3	1.10	33.2	5.5	1.79
Phaseolus vulgaris +Corchorus olitorius	15 g	32.0	6.0	1.73	39.2	10.3	3.76
	30 g	35.0	7.8	2.31	49.6	12.6	5.16
	45 g	31.0	5.7	1.61	38.9	10.0	3.57
	60 g	28.0	5.0	1.33	35.8	7.4	2.36
Phaseolus vulgaris +Abelmoschus esculentus	…….	26.0	3.8	1.18	34.0	6.0	1.95
Phaseolus vulgaris + Abelmoschus esculentus	15 g	33.0	6.4	1.84	41.8	10.7	4.13
	30 g	36.0	8.0	2.43	51.5	13.5	5.53
	45 g	33.5	6.7	1.80	44.0	11.5	4.58
	60 g	29.7	4.4	1.50	37.2	9.0	3.29
Phaseolus vulgaris + Portulaca oleracea	…….	22.0	2.7	1.04	32.6	5.2	1.55
Phaseolus vulgaris + Portulaca oleracea	15 g	30.0	5.5	1.56	38.0	9.6	3.40
	30 g	34.0	7.3	2.20	47.3	12.0	4.89
	45 g	29.0	4.6	1.45	36.4	8.0	3.07
	60 g	26.5	4.1	1.24	35.0	7.0	2.15
LSD at 5%		1.91	0.88	0.81	1.93	1.18	1.08

Table (3): Effect of incorporating different concentrations of the seed powder of *Raphanus sativus* on yield and yield components of *Phaseolus vulgaris.*(Combined analysis of the two seasons).

Treatments		Yield and yield components					
		Green yield		Dry yield			
Plants	Concentrations of *Raphanus sativus* (g/kg soil)	No.of green pods/ plant	Weight of green pods/plant (g)	No.of dry pods/ plant	Weight of seeds/pod (g)	Weight of 100 seeds (g)	Weight of seeds /plant (g)
Phaseolus vulgaris only	……..	7.20	13.74	7.36	1.64	29.7	10.12
Phaseolus vulgaris + Corchorus olitorius	……..	3.30	3.82	3.16	0.86	21.0	3.45
Phaseolus vulgaris + Corchorus olitorius	15 g	6.30	10.10	6.14	1.49	28.9	9.51
	30 g	8.32	14.79	8.01	1.89	33.2	12.74
	45 g	6.00	10.30	5.95	1.38	28.0	9.36
	60 g	4.36	6.50	3.99	1.10	23.8	5.25
Phaseolus vulgaris + Abelmoschus esculentus	……..	3.52	4.36	3.23	0.95	21.8	3.97
Phaseolus vulgaris + Abelmoschus esculentus	15 g	6.90	11.25	6.61	1.56	31.1	10.60
	30 g	8.65	15.10	8.20	1.93	34.3	13.10
	45 g	7.60	12.32	6.95	1.70	31.6	11.42
	60 g	5.51	7.42	4.97	1.22	25.3	7.83
Phaseolus vulgaris + Portulaca oleracea	……..	2.95	3.46	2.96	0.79	20.0	2.91
Phaseolus vulgaris + Portulaca oleracea	15 g	5.63	8.80	5.72	1.26	27.0	8.74
	30 g	8.00	14.25	7.84	1.77	32.7	12.10
	45 g	5.10	8.40	4.19	1.19	24.3	7.53
	60 g	4.20	5.80	3.62	1.00	23.0	4.06
LSD at 5%			1.03	1.16	1.15	0.65	2.08

Table (4): Total glucosinolates (μmol/g dry weight) and Total phenolic contents (mg/g dry weight) in the seed powder of *Raphanus sativus.*

Material	Total glucosinolates (μmol/g dry weight)	Total phenolic contents (mg/g dry weight)
Seed powder of *Raphanus sativus*	688.54	69.50

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The Viability of Sperm from Death *Clarias Cariepinus* Male Boodstock used in Induced Breeding. Short Communication

By Birbu'u Kutwal Y., Ubung Cathrine A. & Kyantiki Amesinde A.
Federal University Wukari

Abstract- The aim of the research was to find an alternative way of getting sperm of *Clarias gariepinus* apart from a living fish which will reduce the cost of live catfish male broodstocks for induce breeding. Dead males broodstocks were bought from Wukari fish market at 5.30pm and were transported to Biological Sciences Fish hatchery in a Polyethene bag and were kept over night in 100litre bowl with water at a level of 80litre. The bowl was not covered in case of jump out. The dead fish sperms were removed carefully and stored in sterilized small bowls containing 0.9% Nomal saline at 7.0am the following day which were later used to fertilize the stripped eggs after a latency period of 8.00hrs (15.30hrs) from hypophysation. The fertilized eggs were spread on the kakabans in a single layer to prevent clumping of eggs in the incubator and flow-through water system was opened for availability of oxygen for the developing embryos. The result revealed that hatching started on the second day after hypophysation at 11.00am. Feeding started two days after hatching with 0.2-0.3mm blue crown feed bought from Jos. The fry survived beyond the experimental period of two weeks from hatching.

Keywords: *hypophysation, clarias gariepinus, dead males, kakaban, normal saline.*

GJSFR-C Classification: *FOR Code: 069999*

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I. Introduction

The trade and economy of a particular country grows bigger due to the availability of fish and fish products in their diets especially where malnutrition is a threat to human development. Fish essential protein contributes a lot in Nigerians populace and human population is inevitably on the increase as well as the demand for fish as source of protein is very high(Solomon and Olawale, 2018). Indeed, fisheries sector over the years have suffered neglect in terms of broodstock and hatchery management for conservation purposes (Birbu'u Kutwal *et al*., 2018). Recently, there has been tremendous increase in the development of fish farming and culture attributed to the increased need for affordable animal protein, especially in the tropics (Davies *et al.,* 2006). Therefore, catfishes of the family Clariidae are increasingly being used for freshwater aquaculture in Africa, owing to several favourable cultural characteristics that enable them survives harsh environmental conditions than other fishes. Despite this, there has been slow awareness about fisheries resources as means of sustainable wealth creation and key in stabilizing any country's economy (Beaumont and Hoare, 2003) as cited by Birbu'u Kutwal *et al*. (2018). Indeed, the increasing population of man and animals depends on the fish and fish products for provision of easily absorbable and utilizable proteins against that from other animals and plants. The sustainability of the fish resources depends on the management of fish broodstocks which in turn make the fish fingerlings availability for out growth to farmers. There used to be wanton destruction of catfish male broodstocks by sacrifizing them for sperm or milt extraction. Birbu'u Kutwal *et al*. (2018); Diyaware *et al*.(2010); Yisa *et al.(2013,* 2016) and Bhushan *et al*.(2018) made surgery operations and suturings on the male broostocks of *Clarias gariepinus*, *Clarias anguillaris*, *Clararias gariepinus, Heterobranchus bidorsalis* and *Clarias batrachus* respectively and all of them reported the successful survival rate of the catfish male broodstocks after the removal of their testes for induce breeding. This of course reduces the unnecessary destructions of the male broodstocks purposely because of breeding.

However, there could be instances where the male broodstocks may not have the sufficient milt for the fertilization, or the milt may not be matured at all after incision or even worstly the male broodstock may die due to inadequate management technicalities. In these cases, this work intend to use sperm or milt of dead fish from the market to fertilize the ripe eggs which will go a long way in salvaging that problem of lack of live catfish male broodstocks use in induce breeding.

II. Materials And Methods

Female broodstocks of *Clarias gariepinus* were bought from a reputable fish farm in Jos and were transported to the Department of Biological Sciences, Fish Hatchery(Laboratory), Federal University Wukari, Taraba State Nigeria in a 50litre jarry can with the top being perforated for easy mixing of oxygen. They were acclimatized for two weeks before the work started. Dead male broodstocks were also bought from Wukari Fish market at 17-18hrs and were also transported in polyethene bags to the same laboratory the previous day for the hypophysation of the live female broodstocks. They were kept over night in a bowl of 100litre without covering the container. The dead males

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were operated at 6.0am to remove the testes and were then kept in a sterilized small bowl with its mouth open which was containing 0.9% Normal saline. The hypophysation was administered at 7.30am the same day and a latency period of about 7-9hrs(13-15hrs) was monitored, which was depended on 29-31°C as revealed by Hogendoorn and Vismans (1980). The injected females were stripped and the eggs flowed out like a stream of water in to sterilized clean bowls and the sperms were removed, sliced with the blade and squeezed for the sperm or milt to come in contact with the eggs. Sterilized birds feather were used to mix the stripped eggs and the milt or sperm thoroughly for fertilization to take place. The Normal saline was added to ease the mixture after which ordinary water was also added to facilitate the fertilization and igniting the stickiness substances of the eggs to attach themselves on the kakabans in the hatchery or incubators for hatching. The eggs were spread gently on the kakabans carefully to prevent their clumsiness on each other where hatching can be affected. A flow-through hatchery was constructed where the eggs were incubated. The water was opened and the amount of the water going in was the exact amount that was going out. The current of the water going inside each incubator depends on the quantity or amount of eggs spread in that incubator. The higher quantity, the faster the current of the water to make dissolved oxygen available.

III. Result

Immediately the milt came in contact with the stripped eggs during mixing with birds feather, fertilization took place while the unfertilized eggs were observed to be whitish. Surprisingly Hatching started around 11.00am (20hrs from fertilization) the following day and the temperature was monitored to be between 29-32°C. Again another shocking finding was that feeding of the fry started at the end of the second day because their yolk was almost 3/4 absorbed at eye observation.

IV. Conclusion

There is an alternative source of sperm or milt of *Clarias gariepinus* from live fish species for induce breeding. Catfish breeders can now use dead male fish broodstocks bought from any market for fertilizing the eggs to be stripped. The cost of *Clarias gariepinus* fingerlings production would be cheap and of course the selling price would also be cheap to farmers and in turn the consumers alike. This will make the availability of fish protein sustained for the mass increase of the human population.

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Diversity, Abundance and Activity Pattern of Wetland Birds Along Cauvery Basin at Kumbakonam, Tamil Nadu, India

By Veeramani. A & Usha. S
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Abstract- The role of avifauna in the ecosystem are as scavenger, pollinators, seeds dispersal agents and predators of insect pest and also an important indicator to evaluate different habitats both qualitatively and quantitatively. Wetlands are also important for birds for their feeding, roosting, nesting and rearing young activities. The present study was conducted in the cultivated areas and water bodies of the villages adjacent to Kumbakonam. Birds were estimated using total count method. Activity pattern and physio-chemical parameters of fresh water habitats were identified using standard methodologies. Thirty one species of water birds belonging to 14 families have been identified in the waterways at the study area. The density of diving birds, swimming birds, small waders, large waders and aerial foragers were slightly higher in the month of November than March. Most of the birds observed and recorded higher in monsoon followed by pre-monsoon and post-monsoon seasons. Physio-chemical parameters of water in the study sites was slightly alkaline nature and contained high amounts of pH, dissolved oxygen, electrical conductivity, salinity and turbidity throughout the study period.

Keywords: *wetland birds, diversity, density, richness, activity pattern, physio-chemical parameters.*

GJSFR-C Classification: *FOR Code: 060899*

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Abstract- The role of avifauna in the ecosystem are as scavenger, pollinators, seeds dispersal agents and predators of insect pest and also an important indicator to evaluate different habitats both qualitatively and quantitatively. Wetlands are also important for birds for their feeding, roosting, nesting and rearing young activities. The present study was conducted in the cultivated areas and water bodies of the villages adjacent to Kumbakonam. Birds were estimated using total count method. Activity pattern and physio-chemical parameters of fresh water habitats were identified using standard methodologies. Thirty one species of water birds belonging to 14 families have been identified in the waterways at the study area. The density of diving birds, swimming birds, small waders, large waders and aerial foragers were slightly higher in the month of November than March. Most of the birds observed and recorded higher in monsoon followed by pre-monsoon and post-monsoon seasons. Physio-chemical parameters of water in the study sites was slightly alkaline nature and contained high amounts of pH, dissolved oxygen, electrical conductivity, salinity and turbidity throughout the study period.

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I. Introduction

Studies shows that wetlands are extremely important areas throughout the world for wildlife protection, recreation, sediment control, flood prevention (Sivaperuman and Jayson, 2000). They are also important bird habitats for feeding, roosting, nesting and rearing young (Wellar, 1999 and Stewart, 2001). Wetlands are being used for agriculture, aquaculture, reclamation for harbouring and industrial purpose, disposing the waste materials, discharging the industrial seasoning, dumping dredged soil, coir retting and for fishing (Nameer, 1998 and Balachandran *et al*., 2002). Wetlands are the transitional lands between terrestrial and aquatic eco-systems where water table is near the surface or the land and is covered by shallow water (Mitsch and Gosselink, 1986). They are the most productive ecosystems play a vital role in flood control, aquifer recharge, nutrient absorption and erosion control. In addition, wetlands provide home for a many species of wildlife such as birds, mammals, fish, frogs, insects and plants (Buckton, 2007).

Animal biodiversity in India hasmuch number of invertebrate species, 2546 species of fishes, 204 species of amphibians, 446 species of reptiles, 1228 species of bird and 372 species of mammals (Agarwal, 2000). Among the bird, 9000 species were found in the world, over 13% of the world's bird fauna are found in India (Grimmett *et al.*, 1998). The role of avifauna in the ecosystem are as scavenger, pollinators, seeds dispersal agent and predators of insect pest and also an important indicator to evaluate different habitats both qualitatively and quantitatively (Niemi,1985, Bilgram, 1995, Padmavathi *et al*, 2010). The global diversity of birds is considerably decreasing due to anthropogenic activities and climate changes (Rapoport, 1993 and Chen *et al*, 2011).

Out of 310 Indian wetland bird species, 130 are migrant, 173 are resident, however the status is unknown for seven species. Among the migrants, 107 are winter migrants, six have some passage population(s), 13 are summer migrants, and the remaining four are purely passage migrants (Kumar *et al.,* 2006). Systematic study on diversity and abundance of the water birds of Cauvery delta region is lacking. Hence the present study intended to document the avian fauna of these wetland habitats which was carried out from September 2016 to August 2017 with the following objectives.

Objectives

- To determine the status, distribution and abundance of wetland birds,
- To find out the activity pattern of important species of birds,
- To know the water quality parameters of the wetlands and
- To identify the conservation problems facing by wetland birds.

II. Materials and Methods

a) Study location

The Cauvery is one of the largest Indian river and its origin is at Talakaveri of Kodagu in Karnataka, flows towards south and east through Karnataka and Tamil Nadu states and across the southern Deccan

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plateau through the southeastern lowlands, emptying into the Bay of Bengal. In Tiruchirappalli the river becomes wide, with a sandy bed, and flows in an eastern direction until it splits into two at upper Anicut. The northern branch of the river is called the Kollidam while the southern branch retains the name Cauvery and then goes directly eastwards into Thanjavur District. Then the river splits and goes to few places in the Delta regions of Cauvery.

Kumbakonam is located at 10.97°N and 79.42°E. It lies in the region called "New Delta" comprising of the southern taluks that were brought under irrigation by the construction of the Grand Anicut canal and the Vadavar canal in 1934. It has an average elevation of 26 metres. The town is bounded by two rivers, the Cauvery River on the north and Arasalar River on the south.

Kumbakonam is surrounded by extensive paddy and other crops cultivation. Methods of irrigation were considerably improved following the opening of the Mettur Dam. The present study was conducted in the cultivated areas and water bodies of the villages adjacent to Kumbakonam are given in the Table. 1.

Table 1: Habitats selected for the study on Birds

Sl. No.	Place	River	Pond	Paddy field
1	Neelathanallur	*		*
2	Kumbakonam	*	*	
3	Karaikurichi		*	
4	Melathukurichi			*
5	Arul Mozhi		*	
6	Kadichambadi		*	*
7	Devanancheri	*		*
8	Asur		*	*
9	Paratai	*		*
10	Mathanathur	*	*	*

**Study habitats*

III. Study Methods

Observations were made in the morning and afternoon hours between the months of September 2016 to August 2017. Surveys were conducted on daily basis at different locations like agriculture fields, wetlands and tanks, river banks, road side, trees, etc. At each sighting birds were counted using a binocular and identified. In case of doubtful identification, photographs were taken and the species is identified later by consulting experts. Identification of birds was also done using field guides (Ali and Ripley, 1987; Grimmet *et al*., 2000). The checklist was prepared using standardized common and scientific names of the birds following Manakadan and Pittie (2001). Abundance of the birdswere established upon the following criteria: Common- recorded 9-10 times out of 10 visits, fairly common- 6 -8 times, uncommon- 3 -5 times and rare- recorded 0 -2 times out of 10 visits.

Birds were estimated using total count method (Hoves and Bakewell, 1989). In this method, representative wetlands were identified and birds were counted. All the visible individuals in the study area were counted by direct encounter method. Food and feeding and other behaviours was investigated using the observational method of Altman (1974). The activity patterns of each species were recorded by using focal and scan sampling methods (record each animal's behavior at predetermined time for certain period) with 5 minutes intervals (Feeroz and Islam 1992, Hasan *et al.* 2005, Akhtar*et al*. 2007, 2009, Martin and Bateson 1993). The activities of all the visible individuals were recorded in each scan. The behaviour of one individual during the scan was recorded as one observation. Other important behaviours (event or instantaneous behaviour e.g. courtship and copulation, mating etc.) were also noted. Activities were recorded as foraging and feeding, moving, resting, calling, preening, chasing, hiding and breeding (Akhtar*et al*. 2009).

Species density: The individual and total water bird densities for different months, climatic season and regions of the study area were calculated as numbers per hectare. In order to investigate the variations in diversity of bird species and ecological groups during different month of the study period the species diversity was calculated using Shannon wiener index (Shannon and Wiener, 1949).

Physical and chemical analysis: Temperature, pH and DO were measured in the collection point, using mercury in glass Thermometer. The collected samples are immediately transferred and analysed in the laboratory. All samples analysed for various water quality parameters are determined according to standard procedure APHA (2005). The metals were

Analysed using Elmer Perkin Model 8100c Atomic Absorption Spectrophotometer.

Correlation analysis: The bird density, diversity, richness and physio-chemical factors are correlated with the help of SPSS and MINITAB softwares. Multiple regression equation model was developed for bird population characteristics feature (density, diversity and richness) and it was investigated for their influence of water quality parameter (Nagarajan, 2002).

IV. Results And Discussion

The present investigation is showing that there are thirty one species of water birds belonging to 14 families have been identified in the waterways at the study area. Totally 65 percent of the birds were identified at the study area are belongs to the ecological group of large and small wader birds (Table 2). These birds were ecologically classified into six groups namely, Divers, Swimming birds, small waders, large waders, aerial foragers and fringe feeders. Lower species richness of birds in this area is attributed due to the smaller size of the wetland (Gajardo *et al.*, 2009). As reported earlier from the Western Ghats, highest number of birds was recorded during the months of winter and there was a reduction in population size during the monsoon (Daniels, 1998). Many factors, which threaten the wetland ecosystem and in turn the bird population, were identified during the study. Birds use wetlands as a source of drinking water and for feeding, resting, shelter and social interactions (Steward, 2007).

Table 2: Water birds recorded at the Study areas

Sl. No.	Common Name	Scientific Name	Order	Family	Ecological Group
1	Little Grebe	Podicepsruficollis	Podicapediformes	Podicipedidae	Diver
2	Little cormorant	Phalacrocoraxniger	Pelecaniformes	Phalacrocoraxidae	Diver
3	Darter	Anhinga rufa	Pelecaniformes	Anhingidae	Diver
4	Common coot	Fulicaatra	Gruiformes	Rallidae	Diver
5	Purple moorhen	Porphyrioporpyrio	Gruiformes	Rallidae	Swimming bird
6	Pheasant tailed jacana	Hydrophasianuschirurgus	Charadriiformes	Charadriidae	Small wader
7	Little ringed plover	Charadriusdubius	Charadriiformes	Charadriidae	Small wader
8	Black winged stilt	Himanotopushimanotopus	Charadriiformes	Charadriidae	Small wader
9	Red wattle lapwing	Vanellusindicus	Charadriiformes	Scolopacidae	Small wader
10	Green shank	Tringanebularia	Charadriiformes	Scolopacidae	Small wader
11	Green sand piper	Tringaorchropus	Charadriiformes	Scolopacidae	Small wader
12	Common sand piper	Actitishypoleucos	Charadriiformes	Scolopacidae	Small wader
13	Little stint	Calidrisminuta	Charadriiformes	Scolopacidae	Small wader
14	Little egret	Egrettagrazetta	Ciconiiformes	Ardeibae	Large waders
15	Grey heron	Ardeacinerea	Ciconiiformes	Ardeibae	Large waders
16	Purple heron	Ardeapurpurea	Ciconiiformes	Ardeibae	Large waders
17	Large egret	Ardea alba	Ciconiiformes	Ardeibae	Large waders
18	Median egret	Egrettaintermedia	Ciconiiformes	Ardeibae	Large waders
19	Cattle egret	Bubulcuss ibis	Ciconiiformes	Ardeibae	Large waders
20	Pond heron	Ardeolagrayii	Ciconiiformes	Ardeibae	Large waders
21	Open bill stork	Anastromusoscitans	Ciconiiformes	Ciconiidae	Large waders
22	White ibis	Threskiornismelanocephalus	Pelecaniformes	Threskiornithidae	Large waders
23	Black ibis	Pseudibispapillosa	Pelecaniformes	Threskiornithidae	Large waders
24	Little tern	Sterna albifrons	Charadriiformes	Laridae	Aerial forager

Sl. No.	Common Name	Scientific Name	Order	Family	Ecological Group
25	Small blue kingfisher	Alcedoatthis	Coraciiformes	Alcedinidae	Aerial forager
26	Pied kingfisher	Cerylerudis	Coraciiformes	Alcedinidae	Aerial forager
27	White breasted kingfisher	Halcyon smyrnensis	Coraciiformes	Alcedinidae	Aerial forager
28	White breasted waterhen	Amaurornisphoenicurus	Gruiformes	Rallidae	Small wader
29	Pied wagtail	Motacilla alba	Passeriformes	Motacillidae	Fringe feeder
30	Grey wagtail	Motacillacinerea	Passeriformes	Motacillidae	Fringe feeder
31	Brahmini kite	Haliasturindus	Accipitriformes	Accipitridae	Aerial forager

Total abundance of water birds seen in the study areas are given in the Table. 3. In the case of Kingfishers white-breasted kingfisher (118) is the most sighted bird followed by pied kingfisher (44) and small blue kingfisher (28). Among egrets, median egret (562) was sighted higher followed by cattle egret (209), little egrets (185). Whereas large egrets were sighted very less (38) in number. Pond heron is the bird sighted higher (419) and grey herons sighted very less in number (59). Among the cormorants only little cormorants were seen less in number (8) whereas darter sighted high (23). Grey wagtail is the bird sighted high in number (175), followed by common sand piper. Others were seen only very less in number (Table. 3). The percentagewise water birds recorded in the agriculture fields especially paddy fields are higher (58%), followed by ponds (26%) and rivers (16%) (Fig. 1).

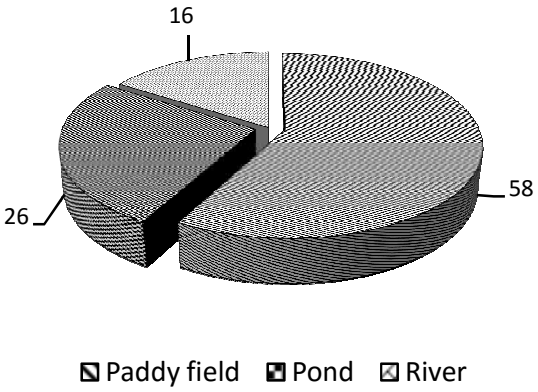

Fig. 1: Percentage of usage of different habitat types by water birds

Table. 3: Abundance of water birds sighted in the study areas

Name of the bird	Total numbers sighted
Kingfishers	
Small Blue Kingfisher	28
White-breasted kingfisher	118
Pied Kingfisher	44
Egret	
Little Egret	185
Median Egret	562
Large Egret	38
Cattle Egret	209
Herons	
Pond Heron	419
Grey Heron	59
Cormorants and darter	
Little Cormorant	8
Darter	23
Spoonbill, bittern, ibis and storks	
Black Ibis	15
Purple Moorhen	9
Common Moorhen	42
Pheasant-tailed Jacana	7
Coot	19
Dabchick	78
White-breasted Waterhen	44
Grey Wagtail	175
Pied wagtail	61
Brahmini kite	65
Common sandpiper	106
Red – wattled lapwing	45

Density: The density of birds which are observed and recorded in the study areas were presented in Fig. 2. The density of diving birds, swimming birds, small waders, large waders and aerial foragers were slightly higher in the month of November than March. Similarly, most of the birds observed and recorded higher in monsoon followed by pre-monsoon and post-monsoon seasons. DeshkarSona *et al*., 2010 reported the density and species richness of birds are expected to be highest during winter when migratory population arrive and minimum during monsoon when the migratory populations leave the area and the resident species are engaged in the nesting activities. In the present study the density of diving birds, swimming birds, small waders, large waders and aerial foragers were slightly higher during the month of November than March. The species richness of diving bird and swimming bird were higher in the month of January and lower in the month of August. Species richness of small waders was high in the month of February and lower in August. In other hand richness of large waders was high in the months of November and lower in August. Thus the richness of large waders was higher during monsoon season of the study periods. Most of the birds observed and recorded higher in monsoon followed by pre-monsoon and post-monsoon seasons.

Pollution, mainly in the form of chemical effluents is the major threats to the birds in this ecosystem. The study area is one of the major feeding ground of many water birds and other resident species. During summer ponds are dried without water and peopleuse to catch fishes. This activity makes the birds ignore ponds during summer except kites. Similar studies shows water is a major driven factor that affected aquatic vegetation composition and food resources that influenced bird density, diversity and distribution (Colwell and Taft 2000; Quinn 2002; Wilcox *et al*., 2002; Mohanraj and Pandiyan, 2015).

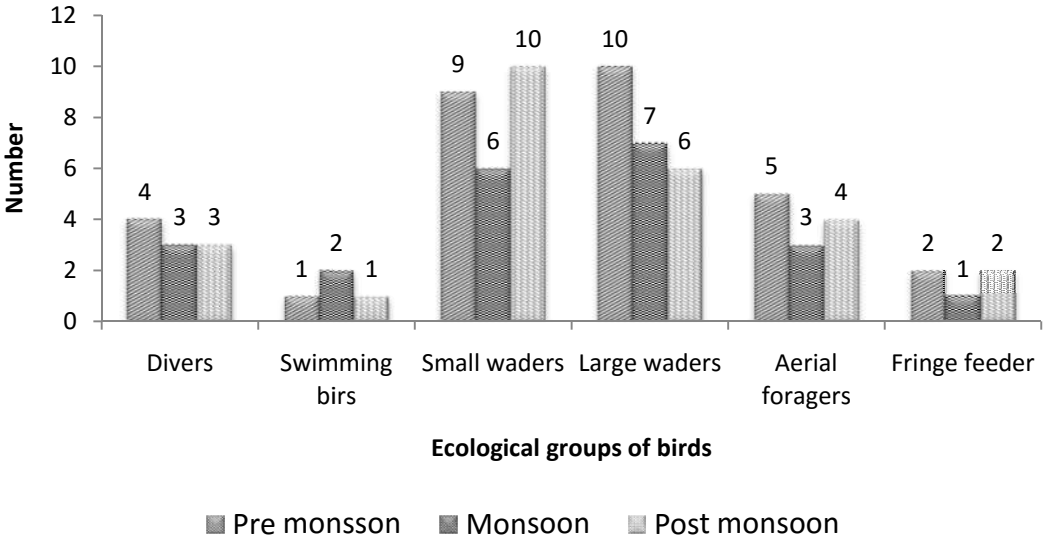

Fig. 2: A comparison of season wise variations in the bird density of the study periods

Diversity: The diversity of diving birds was highest in the month of February (1.07±0.2) and lowest in August (0.5±0.1). Similarly, the diversity of diving bird was higher in pre-monsoon (1.06±0.8) than monsoon and post monsoon periods. The diversity of small waders was higher in the month of November (1.67±0.1) and lower in August (1.17±0.1) at the same time the diversity of large waders was higher in November (1.88±0.3) and lower in month of March (1.54±0.1). The small waders and large waders were higher in monsoon followed by post monsoon and pre monsoon. In the other hand the diversity of swimming birds and aerial foragers were higher in the month of December and lower in March. Thus the diversity of swimming bird and aerial foragers were very high during monsoon and low in pre monsoon (Fig. 3).

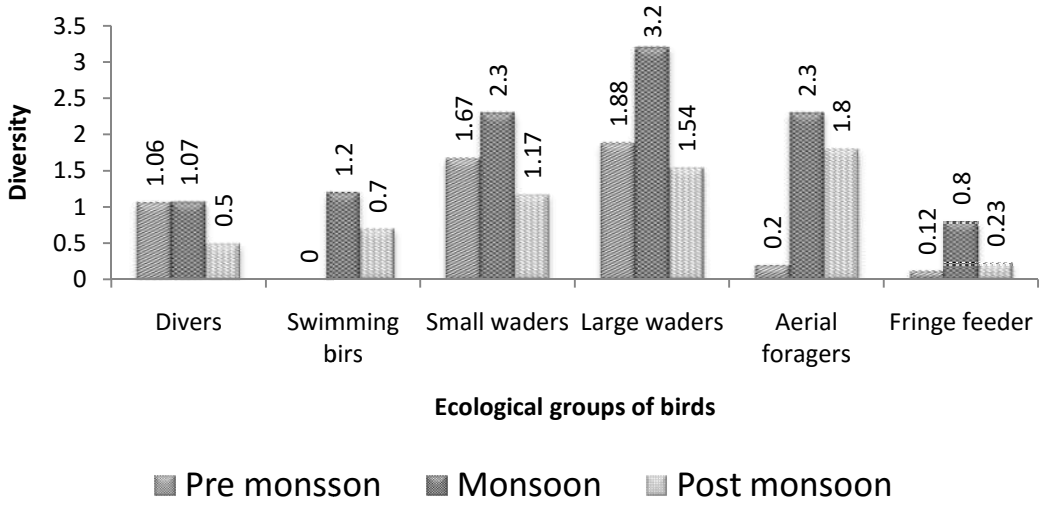

Fig. 3: A comparison of season wise variations in the bird diversity of the study periods

Richness: The species richness of diving bird and swimming bird were higher in the month of January and lower in the month of August similarly they are low in pre monsoon than post monsoon (Fig. 4). Species richness of small waders was high in the month of February (9±2.6) and lower in the month of September (5±1.5). Thus the post monsoon (8.7 ± 2.2) months of the study periods had higher species richness of small waders. In the other hand richness of large waders was high in the months of November (13±1.5) and lower in the month of August (10±1.2). Thus the richness of large waders was higher during monsoon (10±1.2) season of the study periods (Fig. 4). The manmade water bodies constructed by man to satisfy his own needs also form important habitats for several avian species. To study any ecosystem the birds serve as important component as they have the ability to fly away and avoid any obnoxious condition. Hence, they are considered as important health indicators of the ecological conditions and productivity of an ecosystem (Desai and Shanbhag, 2007, Li and Mundkur, 2007). The most important parameters of the bird study are the species richness

(Murphy *et al.*, 1984), their density (Nilsson and Nilsson, 1993) and diversity (Krebs,1985). However among avian communities, the components of diversity are known to differ between locations and seasons (Bethke and Nudds, 1993).

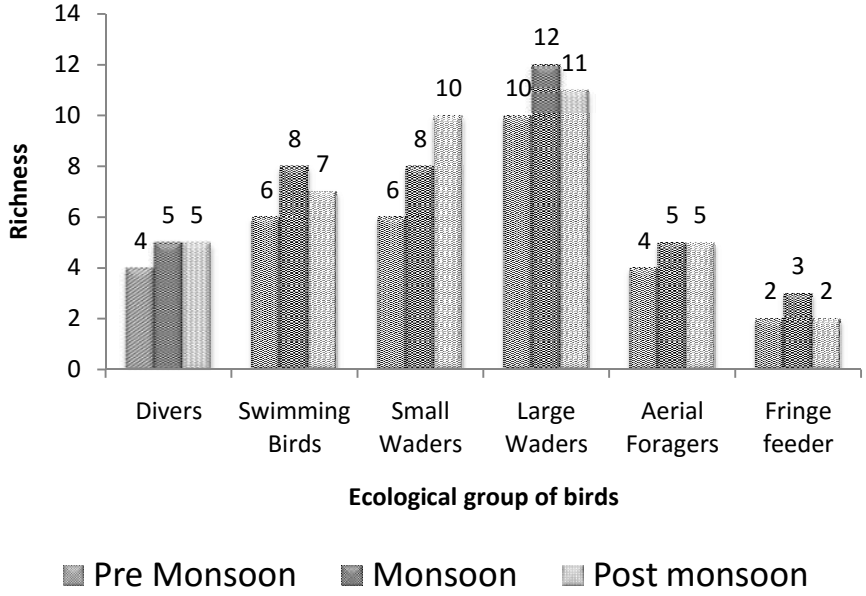

Fig. 4: A comparison of season wise variations in the bird richness of the study periods

V. Activity Budget Of Selected Water Birds

All the birds have their own activity pattern for its daily life. Different activities observed in selected water birds are given below.

a) Pond heron

Pond heron is a shy bird takes more time for resting activity. The present observation on activity budget of pond heron shows most of its time they spent for resting or perching (55%) in a trees present adjacent to the pond. They do fishing and feed on other arthropods and spent 25% for feeding activity. They may fly in a short duration within or periphery of the pond. The present observation shows 14% of its time they did flying activity. Occasionally pond herons makes sound for communication with their pair.

b) Little grebe

The activity budget of little grebe was recorded and it show most of the time they do swimming (38%) under water and feeding (49%) activities. Other activities such as flying and courtship with its mate is less.

c) Pied kingfisher

Pied kingfisher shows that it takes most of its time perching (37%) and flying (29%) activities. Hovering activity shows (14%) while attacking the prey and very little time it takes feeding and vocalization activities.

d) Pheasant tailed jacana

In the present study it takes most of its time for feeding activity (42%) followed by walking (38%) activity. Other activities are flying (12%) and interacting with other birds of its own and other birds.

e) Common moorhen

The activity budget of common moorhen shows that it spent most of its time for swimming activity for 43%. Feeding activity was observed (29%) followed by resting (19%) and courtship (9%) activities.

All the observations shows that the water birds in the study area normally active during early hours and late hours of the day, since the sunlight is warmer heavily in the mid day. The surroundings of the pond also polluted heavily for keeping all debris and are dumped along the bank. High resting in summer might reflect the tendency to rest in warmer day light hours of the water birds. Tamisier (1976) had also reported that wintering waterfowl benefit thermodynamically by feeding at night and preening, resting and courting during the warmer day light hours. In fact, the birds were seen to rest over the large floating leaves of water lily and grassy patches or other free floating vegetations. The water birds foraged and fed most actively before noon. After overnight fasting they try to maximize foraging and feeding during early morning. Similar observation was found in Bronze-winged Jacana (Akhtar *et al*. 2009).

f) Physico-chemical analysis of water

The results of water quality analysis and Phsysico-chemical characteristics of water are presented in the Table 4. The water was slightly alkaline nature and contained high amounts of pH, dissolved oxygen, electrical conductivity, salinity and turbidity in all

the seasons are examined. The surface water temperature was recorded highest during the post monsoon season (29.4 ± 0.12° C) than the other seasons. The water depth (115±2.62 cm) was elevated in the monsoon season. The dissolved oxygen (6.4 ± 0.1 mg/l), salinity (54.4 ± 2.9 mg/l) was increased during the post monsoon season. The turbidity (2.5±0.9 NTU) was recorded highest in the pre monsoon season during the study period. The elevated level of electrical conductivity (662.5±15.7 mho/cm) was recorded during the pre monsoon season. High amount of pH was recorded in monsoon seasons during the study periods most of the parameters were slightly higher in the post monsoon than monsoon (Table 4). As anticipated the - chemical parameters of water varied according to the seasonal fluctuations. Significant drop in the water cover during the post monsoon is predominantly because of the evaporation, however the water is also utilized for irrigating the neighboring fields. This also results in increasing the solids in water. The bird density was negatively correlated with water cover too. During the monsoon and the post monsoon the water level were high in turn maximum birds were present. The previous reports finding of DeshkarSona *et al*., (2010) during monsoon the dissolved oxygen and the salinity are high which can be due to vigorous mixing of water because of precipitation. High amount of pH was recorded in monsoon seasons during the study periods most of the parameters were slightly higher in the post monsoon than monsoon.

VI. Relationship Of Water Quality Parameter With Water Bird Population

Density of water birds: The correlation between water bird density and the water quality parameter revealed that the turbidity, Dissolved oxygen, salinity and electrical conductivity were negatively correlated. The pH and water depth were positively correlated. The temperature (-0.803) was negatively correlated at the significant level of $P<0.05$ and water depth (0.722) was positively correlated at the significant level of $P<0.05$ (Table 4).

Diversity water birds: Relationship between the diversity of total water bird and the water quality variables revealed that the electrical conductivity, dissolved oxygen, turbidity and salinity levels were negatively correlated in the study period. The pH level was positively correlated. The temperature (-0.88) level was negatively correlated and its significant level of $P<0.05$. The water depth (0.818) was positively correlated and significant level of $P<0.05$ (Table 4).

Richness of water birds: The correlation between the water bird richness and the water quality variation revealed that the temperature (-0.85) was negatively significant and its significant level of $P<0.01$. The electrical conductivity (-0.709) was negatively correlated at the significantly level of $P<0.01$. The pH (0.7) was positively significant of $P<0.05$. The depth level was positively correlated and the dissolved oxygen, salinity and turbidity levels were negatively correlated in the study period (Table 4).

Table 4: Correlation between water bird density, diversity, richness and water quality parameters at the study areas

	Density	Diversity	Richness	Depth	Temp	pH	DO	Salinity	Turbidity	EC
Density	1									
Diversity	0.862**	1								
Richness	0.650	0.917**	1							
Depth	0.690*	0.354*	0.008	1						
Temp	-0.800*	-0.472*	-0.135*	-0.821*	1					
pH	0.319	0.245	0.105*	-0.059	0.323	1				
DO	-0.003	-0.380	-0.582	-0.558	0.220	-0.174	1			
Salinity	-0.653	-0.293	-0.046	-0.871**	0.706	-0.047	0.512	1		
Turbidity	-0.271	-0.259	-0.214	-0.198	0.095	-0.371	0.391	0.280	1	
EC	-0.670	-0.528	-.441*	-0.553	0.344	0.185	0.297	0.505	0.116	1

*. Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)

All the water quality factors were found to be significantly influence one or more water bird population characteristics. Sampath and Krishnamoorthy (1993) were reported on the effect of water quality factors for the water birds in a wetland. In the present study the correlation between the water bird richness and the water quality variation revealed that the temperature was negatively significant. The electrical conductivity was

negatively correlated significantly. The pH was positively significant of $P<0.05$. The depth level was positively correlated and the dissolved oxygen, salinity and turbidity levels were negatively correlated during the study period.

The present study concluded that the importance of the Cauvery basin as they prove to be the important feeding ground for the migratory and the resident species of the birds. Moreover various abiotic parameters play an important role to make up the density, diversity and richness of the water birds hence indicating a single abiotic factor is unfeasible. Thus it can be concluded that the variation in the water quality and the availability of different prey determined the distribution and diversity of aquatic birds in the area during the study period.

This study is proved that the water birds play an important role of the ecosystems as a biological agent of insect pest, helping the farmers in the way of giving free manure in the form of guanos, etc. and that if the present ecological characteristics of this wetland continue, the birds were unable to inhabit this habitat in the immediate future. Proper awareness class regarding the importance of birds to the local people, through different programmes will ultimately help the protection of birds of this region.

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Study of Phytochemical Composition of Generative Organs of Standardized Drug Raw Material *Crocus Sativus* L.

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Abstract- The article is devoted to the study of the development of methods for standardization of medicinal plant raw materials for the preparation of conditions for the maximum production of biological active substances from seed saffron.

Keywords: *crocus sativus, hexane extract, benzene extract, chromatographic mass spectro photometer.*

GJSFR-C Classification: *FOR Code: 279999p*

Strictly as per the compliance and regulations of:

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Abstract- The article is devoted to the study of the development of methods for standardization of medicinal plant raw materials for the preparation of conditions for the maximum production of biological active substances from seed saffron.

Keywords: crocus sativus, hexane extract, benzene extract, chromatographic mass spectrophotometer.

I. Introduction

According to the Decree of the Cabinet of Ministers of the Republic of Uzbekistan from 2017 on August 21, EDO-03 / 1-421 "On measures to create saffron plantations, meet the needs of the pharmaceutical industry and cultivate exported medicinal plants", scientific works in applied research are conducted at the Uzbek Chemical-Pharmaceutical Research Institute on the topic "Studying as a plant raw material saffron seed *Crocus sativus* for obtaining medicines" for registration number PZ-20170919120.

The research was carried out at the Institute of Botany under the Academy of Sciences of the Republic of Uzbekistan.

Many scientists have studied taxonomy, morphology, and the cytology of existing such species of Saffron as *C. sativus*, *C. alatavicus* family of Iridaceae [7]. First of all, this is due to the valuable therapeutic and nutritional properties of saffron [2].

Abdullaev (2003) pointed out that saffron can be useful in cancer chemoprophylaxis in the near future [1].

Saffron was and still remains a very expensive spice (the cheapest Iranian saffron costs 460-470 US dollars per 1 kg, Greek saffron - 770-790 US dollars per 1 kg (Reuters) The most expensive Spanish saffron costs 900-950 dollars USA for 1 kg.), Since growing and obtaining it requires high costs (to get 1 kg of dry saffron, you need to sort out about 2000 flowers.) From 1 hectare plantation in the first year, you can collect only 6 kg of saffron, in the second year - up to 20 kg .). In the Middle Ages, merchants made whole fortunes on this spice, investing in the cost of the goods the cost of its transportation. The use of saffron in food could only allow wealthy people. It is no accident that the flowers of saffron became a symbol and were used in the heraldry of bourbons. Lily is nothing but a symbolized saffron flower.

The purpose of the research is to select and develop methods for standardizing medicinal plant raw materials in order to prepare the conditions for the maximum production of biological active substances from seed saffron.

II. Results and Discussion

The analysis of literature sources showed the effectiveness of the application of stigmas of the flowers of the tuberous saffron plant (*C. sativus*) [1, 8].

Dried in the conditions of herbal drying, vegetable raw materials are randomly confused fragile non-adherent filaments, consisting of stigmas, single or sitting on short posts of three stigmas. Each stigma has the appearance of a differently curved tubule, widening gradually towards the apex and terminating in an irregularly irregular jagged margin [5].

To determine the authenticity, a sample of 100 grams of ground saffron was placed in a measuring glass flask with a capacity of 1000 cm3 and poured into a third of the volume of purified water. Extraction of colorants was carried out for 20 minutes and then insisted for 12 hours. The volume in the flask was brought to a mark and with thorough mixing the aqueous phase was colored bright yellow.

The organoleptic analysis showed that the color of the stigma is dark orange with a transition in the lower part to yellow, the taste is spicy, specific for saffron (glycoside picrocrocin), the smell is spicy-bitterish, slightly tart (aldehyde-safranal).

Further according to ND [2] conducted studies to determine the mass shares of the following quality criteria: moisture; general ash; ash, insoluble in 10% hydrochloric acid; essential oil; stagnant and stumbling into hard-to-break lumps of stigmas; crushed stigmas passing through a sieve with holes of 2 mm; foreign impurities. Table 1 shows the results of the study of the above indices in serial samples of medicinal raw materials, the results comparatively compared with the permissible norms (Table-1).

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Table 1: The results of a comparative study of *C. sativus* under the conditions of introduction

№	Indicators	Amount sample	Results	
			norm	actually
1	Mass fraction of moisture,%, not more than	15	12,0	10,7
2	Fraction of total mass of total ash,%, maximum	10	7,0	6,3
3	Mass fraction of ash insoluble in 10% hydrochloric acid,%, not less than	100	1,5	1.7
4	Fraction of total mass of essential oil,%, not less than	100	0,5	0,8
5	Mass fraction of stigmas impure and stuck in hard-to-separate lumps,%, not more than	100	5,0	3,2
6	Mass fraction of crushed stigmas passing through a sieve with holes of 2 mm,%, not more than	100	2,0	1,6
7	Mass fraction of foreign impurities,%, not more than	100	0,1	0,06

To determine the quantity in plant raw materials of value both in the therapeutic and nutritional plan of the basic substances, scientists recommend two methods: by distillation (Guenther E.) and HPLC (Kun and Winterstein) [4, 6].

Using the ground according to specifications, the raw materials obtained an extract based on hexane and benzene by the method of three-time maceration. Preliminary experiments to identify and determine the amount of constituents were carried out in an agilent 7890AGC gas chromatograph and an AGILENT 5975 C inet MSD chromatographic mass spectrophotometer. The obtained mass spectra were compared with the information of the electronic library W8N05ST.L and NIST08. The results are shown in Tables 2-3 and figures 1-2.

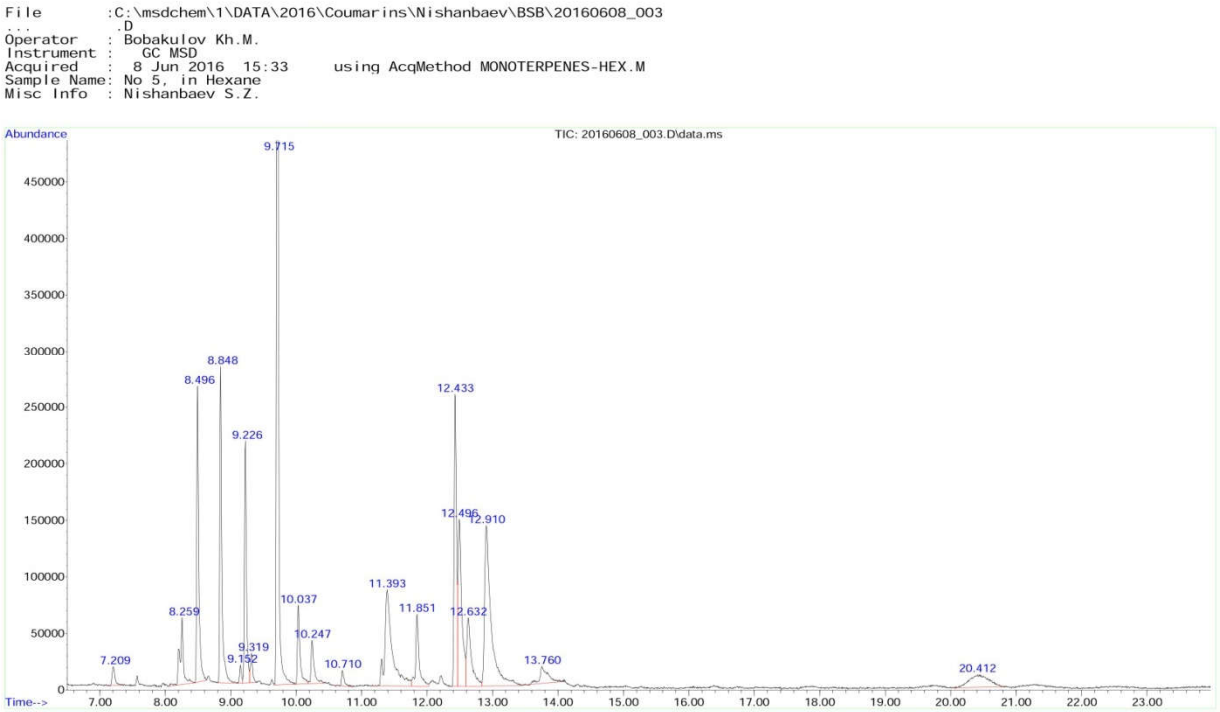
Table 2: The chemical composition of the hexane extract of *C. sativus*

№	Name of component	Retention time, sec. (R_t)	Content, %	Retention index, (*RI*)
1	1-Carboxaldehyde-5,5-dimethyl-2-methylene-3-cyclohexene	8.258	2.73	1110
2	α- Isophorone	8.498	7.02	1126
3	2,6,6- Vachmethyl -2-cyclohexene-1,4-dione	8.848	7.72	1149
4	2,2,6- Vachmethyl -1,4- cyclohexanedione	9.223	5.74	1173
5	2,6,6- Vachmethyl -1,3- cyclohexanedione -1-carbaldehyde	9.715	23.40	1205
6	2-Hydroxy-3,5, 5-omethyl-2-cyclohexene-1,4-dione	10.250	1.55	1242
7	4-Hydroxy-3,5,5-osmethyl-2-cyclohexen-1-one	11.394	8.29	1322
8	2,4,4-Vachmethyl-3-carboxaldehyde-5-hydroxy-1-cyclohexanone-2,5-diene	12.433	8.20	1396

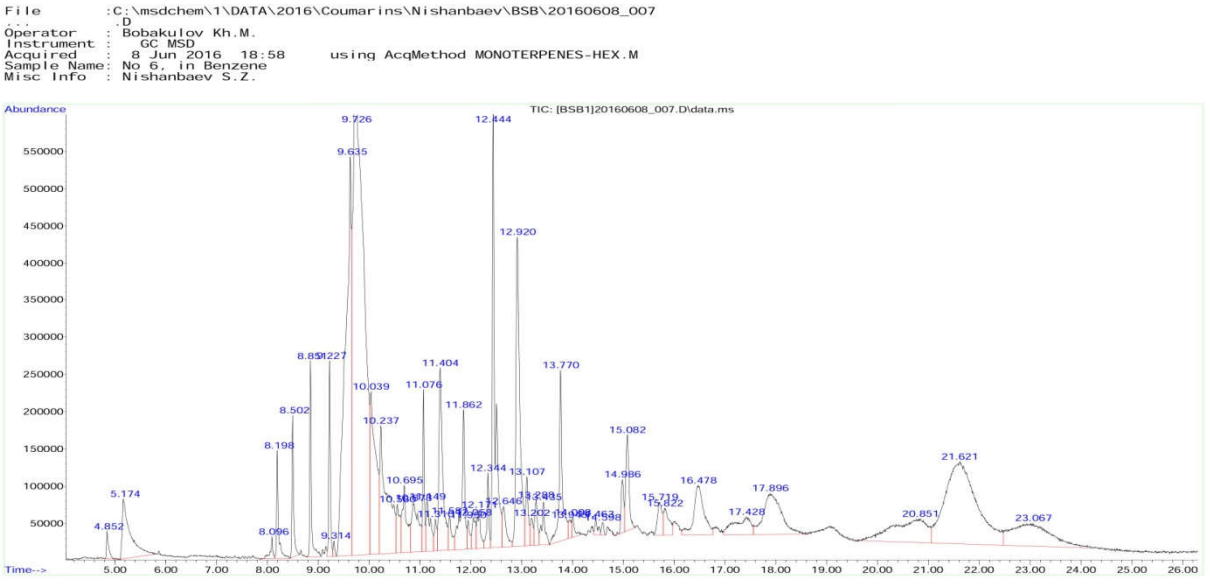
Table 3: The chemical composition of the benzene extract of *C. sativus*

№	Name of component	Retention time, sec. (R_t)	Content, %	Retention index, (*RI*)
1	Heptanal	4.851	0.24	904
2	γ- Crotonolactone	5.177	1.92	923
3	*н*- Undekan	8.098	0.20	1100
4	Nonanal	8.196	0.82	1106
5	α- Isophorone	8.504	0.93	1126
6	4- Oxoisophorone	8.848	1.25	1149
7	2,2,6- Vachmethyl -1,4-cyclohexanedione	9.229	1.16	1174
8	Dihydro-4-hydroxy-2 (3H) -furanone	9.635	9.43	1200
9	3,4-Dihydroxybutane acid addition of γ-lactone	10.557	0.69	1264
10	*н*- Tridecane	11.074	0.97	1299

11	β- Methylnaphthalene	11.148	0.85	1304
12	4-Hydroxy-3,5,5-trimethyl-2-cyclohexen-1-one	11.406	2.77	1323
13	α- Tetradecan	12.347	0.58	1390
14	*н*- Tetradecan	12.445	4.78	1397
15	Octylcyclohexane	13.109	0.73	1445
16	2,6-Di-tert-butyl-p-benzoquinone	13.435	0.57	1468
17	Pentadecane	13.773	2.16	1492
18	α- Hexadecylen	14.984	0.56	1577
19	*н*- Cetane	15.083	1.26	1584
20	*н*- Heptadecane	16.479	2.02	1677
21	3,5-Di-t-butyl-4-hydroxybenzaldehyde	17.425	1.17	1736
22	*Z*-8- Hexadecene	17.893	3.02	1764
23	Methyl 3- (3,5-di-tert-butyl-4-hydroxyphenyl) propionate	20.850	3.28	1911
24	Dibutyl phthalate	21.619	10.56	1936



Picture 1: Spectrum of *C. sativus* hexane extract



Picture 2: Spectrum of *C. sativus* benzene extract

III. Discussion

Preliminary study of C. sativus, grown in local conditions and comparison of results with standards for plant raw materials, showed the compliance of the quality standard indicators in all parameters.

The standards given in the literature on the chemical composition of C. sativus methanol is 68.2%, ethanol 57.6% and α-tocopherol flavonoids is 95.6% [9]. Our studies showed that the hexane extract of the feedstock contains a large amount of 2, 6, 6-trimethyl-1,3-cyclohexadiene-1-carbaldehyde (23.40%), while the benzene extract contains 10.56% dibutylphthalate, which proves the chemical composition of saffron, grown on the territory of the republic with international standards.

IV. Conclusion

According to the phytochemical composition of generative organs *C. sativus* in the hexane extract contains 8 species, in the benzene extract 26 types of substances that are subject to detailed study and development of methods for purification from ballast substances. Research in this direction continues.

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The Allelopathic Effects of *Allium Sativum* Cloves on Growth and Yield of *Helianthus Annuus* Plants Associating *Cyperus Rotundus*

By El-Rokiek, Kowther G., R.R. El-Masry, S.A.A. Ahmed, Sanaa A. Mohamed & Nadia K. Messiha

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Keywords: *garlic cloves extract, sunflower, purple nutsedge.*

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Abstract- Two pot experiments were carried out in the greenhouse of the National Research Centre, Dokki, Giza, Egypt, in the two successive summer seasons, 2015 and 2016 to study the allelopathic potentiality of garlic cloves water extracts (gcwe) on sunflower growth and yield as well as its effect on the growth of purple nutsedge associating garlic plants. Treatments were applied by the spraying of garlic cloves water extracts (gcwe) at 15. 30, 45 and 60 %. The results showed that sunflower growth and yield exhibited the most increase at lower concentrations of garlic cloves water extract. On the other hand, purple nutsedge growth showed complete inhibition with the high concentrations. The results suggested the use of garlic cloves water extract as an alternative to the use of herbicides for controlling purple nutsedge associating sunflower plants.

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I. Introduction

Allelopathy is a natural process in which plants interact with other plant species by releasing allelochemicals into the environment, hence affecting the growth of each other *(Rice, 1984)*. Many higher plant species contain chemicals with an allelopathic activity in different parts *(Duke et al., 2000)*. Under certain conditions, these allelochemicals are released into the environment, either as exudation or through decomposition of plant residues that affect the neighboring plants *(Einhellig, 2004)*. This effect may be positive or negative *(Zhou et al., 2011)*.

Sunflower (*Helianthus annuus* L.) is considered one of the most important oil crops (annual statistical report of the Ministry of Agriculture and Land Reclamation in Egypt). Weeds compete for water, nutrients, light, and space and consequently caused a reduction in sunflower yield. Purple nutsedge is the world's worst weed *(Horowitz, 1992)*. The main propagative way of purple nutsedge is through the basal bulbs and tubers *(Nishimoto, 2001)*. Purple nutsedge caused serious losses when competing with crops (William and Hirase, 2005). In, general the reduction in sunflower yield due to weed competition ranged from 18.6 to more than 60 % (Dawood *et al*., 2012). So, weeds are considered to be a dangerous problem. So, effective management of weeds is the strategy for increasing and producing high sunflower yield and accordingly high oil production.

Garlic (*Allium sativum* L.), a species of the genus *Allium*, is one of the considerable vegetable and medicinal plant used around the world. Garlic extracts were evaluated against different plants, it has been documented to possess allelopathic activity *(Wei* et al*., 2008; Wang* et al*., 2009; Cheng et al., 2011; Xu et al., 2012; Xiao et al., 2012&2013; Wang et al., 2014 ; Cheng et al., 2016; Ding et al., 2016 and Hayat et al., 2016). Zhou et al. (2011)* reported that high concentration of garlic root extract inhibited seedling growth of hot pepper and tomato as well as lettuce. Garlic bulb aqueous extracts at a high concentration inhibited germination and seedling growth of cucumber *(Dong et al., 2008)*. Ultrasonic extracts of three garlic varieties at 0.04g/ml were found to inhibit seed germination, seedling length and root fresh weight of lettuce and hot pepper *(Wang et al., 2009).* The decomposed stalk of three garlic cultivars showed allelopathic inhibitory effects on carrot and lettuce but promoted Chinese cabbage growth *(Xu et al., 2012 and 2013). Yuan et al. (2012)* cited that garlic root exudates, especially the high concentration inhibited significantly the seed germination as well as seedling growth of lettuce, rape, and radish. Garlic cloves extracts (10, 30 and 60%) reduced significantly seed germination, growth parameters and metabolic activities of pea seedlings *(Abou El-Ghit, 2016).*

II. Materials and Methods

Allium sativum (garlic) plants were allowed for complete dryness in shadow then the cloves and stalk were separated, cut and ground. Water extracts at concentrations of 15, 30, 45 and 60% were prepared.

By the basis of the results of chemical analysis of the garlic cloves and stalk, the experiment was carried out with cloves.

a) Pot experiments

Two pot experiments were conducted in the greenhouse of the National Research Centre, Egypt during two summer seasons of 2015 and 2016 Cloves of sunflower (Cv. Giza 102) were obtained from the

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Agricultural Research Centre, Giza, Egypt. The stock of purple nutsedge (*Cyperus rotundus* L.) used as a source of tubers was collected from a dense stand at the National Research Centre garden. The pots, 30 cm in diameter and 30 cm in height, contained equal amounts of sieved soil (2: 1 v/v clay and sand). Sunflower seeds were sown 2 cm deep and allowed to germinate. One dormant tuber of purple nutsedge was planted in each pot in the same time 2 cm depth in the soil. Sunflower seedlings were thinned two weeks after sowing so that two homogeneous seedlings were left per pot. Super phosphate was added to each pot before sowing while Ammonium nitrate was added during plant growth. (2:1w/w). The experiment was arranged at complete randomized design and consisted of seven treatments including: three untreated controls, purple nutsedge only, sunflower only, sunflower with purple nutsedge (unweeded treatment). The other four treatments were used to study the effect of garlic cloves water extracts at concentrations 15, 30, 45 and 60%. The prepared extracts at 15, 30, 45 and 60% of garlic cloves extract were sprayed on sunflower plants and purple nutsedge at the rate of 150ml / pot. The treatments were applied three times weekly starting from 15-day--old plants. The data were taken at 40 days after sowing and at harvest.

b) Characters studied

i. *Purple nutsedge*

Three replicates were collected from each treatment in both seasons at 40 days after sowing (DAS) and at harvest and the following measures were taken:

1-Number of mother shoots/tuber
2- Number of leaves of mother shoots/tuber
3- Length of mother leaves (cm)
4- Number of daughter shoots / tuber
5- Number of leaves of daughter shoots / tuber
6- Number of rhizomes / tuber
7- Length of rhizomes/tuber
8- Number of propagative organs/tuber (basal bulb and tubers)/plant
9- Dry weight of foliage (g/plant)
10- Dry weight of underground organs (g/plant)
11- Total dry weight (g/plant)

c) Sunflower

Sunflower samples were taken from three pots at two stages (40 days after sowing and at harvest) to determine plant height fresh and dry weights.

At harvest, Sunflower plants were collected to determine plant height, head diameter and head weight. Heads were air dried and threshed to determine seeds weight/head and 100-seeds weight.

d) Determination of total phenolic and total flavonoids contents in the plant extracts

Total phenol and total flavonoids were determined in seeds cloves and stalk water extract of *Allium sativum* according to *Srisawat et al. (2010).*

e) Statistical analysis

All data were statistically analyzed according to *Snedecor and Cochran (1980)* and the treatment means were compared by using LSD at 5% level of probability.

III. Results

a) Purple nutsedge

i. *Growth characters of mother shoots*

The results in Table(1) show significant reduction in the number of mother shoots tuber with all concentrations at 40 and at 90 days after sowing (DAS) when compared with the purple nutsedge alone. The number of mother shoots show the highest reduction with spraying garlic cloves extracts at 60% 90 DAS. This later concentration induced more than 50% reduction in the number of leaves of mother shoots, as well as the length of mother leaves especially at harvest as compared to the corresponding untreated control (sunflower + purple nutsedge).

ii. *Growth characters of daughter shoots*

The results in Table (1) show a significant inhibition in the number of daughter shoots as well as number of leaves of daughter shoots with spraying of garlic cloves water extracts (gcwe) up to 60%. The reduction in the number of daughter shoots as well as number of leaves of daughter shoots increased with increasing concentration reaching to complete eradication at harvest by using garlic extract at both 45 and 60% in comparison to the corresponding control.

Table 1: Effect of spraying different concentrations of garlic cloves on different growth parameters of foliage of purple nutsedge at two stages of growth. (Average of the two seasons)

Treatments		Growth parameters									
Plants	% of garlic cloves extract	No. of mother shoots/plant		No. of leaves of mother shoots/plant		Length of mother leaves(cm)		No. of daughter shoots/plant		No. of leaves of daughter shoots/plant	
		At 40 DAS	At harvest	At 40 DAS	At harvest	At 40 DAS	At harvest	At 40 DAS	At harvest	At 40 DAS	At harvest
purple nutsedge (alone)	.....	1.5	3.0	15.5	18.5	57.0	62.0	4.5	16.0	30.5	77.0
purple nutsedge + sunflower	.....	1.0	2.5	13.0	15.5	53.0	56.0	4.0	9.0	23.0	56.0
purple nutsedge + sunflower	15	1.0	2.0	12.0	10.0	50.0	45.0	3.0	3.0	12.0	18.0
	30	1.0	2.0	9.0	8.4	38.0	35.0	2.0	1.0	6.0	4.0
	45	1.0	2.0	8.0	7.1	37.5	28.5	1.0	0.0	4.0	0.0
	60	1.0	2.0	6.0	5.3	30.0	24.0	1.0	0.0	3.0	0.0
LSD at 5%		0.28	0.70	1.36	1.14	1.92	2.45	0.87	1.40	1.75	1.98

iii. *Growth parameters of underground organs*

Table (2) reveal a significant decrease in the underground organs (basal bulb and tubers) of purple nutsedge in all pots sprayed with garlic cloves water extract as compared to untreated pots. The reduction was maximum with 45% of the extract, reached to zero by using 60% of the garlic extract. The inhibition in basal bulb and tubers, in turn resulted in a strong reduction in the number of rhizomes as well as their lengths reaching to complete eradication by using 60% at both 40 DAS and at harvest.

Table 2: Effect of spraying different concentrations of garlic cloves on different growth parameters of underground organs of purple nutsedge. (Average of the two seasons).

Treatments		Growth parameters					
Plants	% of garlic cloves extract	No. of rhizomes/plant		Length of rhizomes (cm)		No. of basal bulbs and tubers/plant	
		At 40 days	At harvest	At 40 days	At harvest	At 40 days	At harvest
purple nutsedge (alone)	.....	4.9	17.0	7.9	9.75	3.5	16
purple nutsedge + sunflower	.....	3.6	10.5	6.7	7.75	3.0	9
purple nutsedge + sunflower	15	3.0	5.0	5.5	4.20	2.0	4
	30	2.5	1.5	5.3	3.83	1.0	1
	45	2.0	1.0	4.6	3.00	1.0	1
	60	0.0	0.0	0.0	0.00	0.0	0
LSD at 5%		0.48	1.40	0.66	0.98	0.63	1.24

b) Fresh and dry weight of foliage (g / plant)

The results in Table (3) reveal a significant inhibition in both the fresh and the dry weight of mother shoot in foliage of purple nutsedge as a result of the spraying different concentrations of cloves water extract of garlic up to 60%. The use of high concentration has the highest rate of reduction in foliage of purple nutsedge reached to 98% at harvest as compared to the control. The reduction in dry weight was more or less similar to the reduction in fresh weight (Table 3).

c) Fresh and dry weight of underground organs (g / plant)

Garlic cloves water extract at different concentrations inhibited significantly both the fresh and the dry weight of underground organs. The inhibition in the fresh and the dry weight of underground organs was most detectable with using 60% of the extract leading to a complete control at 40 DAS and at harvest in comparison to the untreated control.

d) Total fresh and dry weight of purple nutsedge

The reduction in total fresh and dry weight (foliage + underground organs) was to a great extent similar to that recorded in fresh and dry weight of the foliage and underground organs (Table 3) at 40 DAS and at harvest as compared to the corresponding controls.

Sunflower

Effect of garlic cloves water extracts seeds on growth of sunflower plants

Growth parameters

Garlic cloves water extract increased significantly plant height and number of leaves of sunflower as compared to unweeded control. On the contrary, the lowest concentration of the extract (15%) gave an increase in these two characters. The lowest significant increase was recorded by 60% extract at 40 (DAS) as compared to the control (Table 4). Both the fresh and the dry weight of sunflower plants increased significantly with different concentrations of the garlic cloves water extract. The lowest concentration recorded the highest increase in both the fresh and the dry weight over their corresponding controls. Similar trends were recorded until harvest (Table 5).

e) Sunflower yield/plant

Head diameter show different responses according to the concentration of the extract. Spraying garlic cloves extract at 15% was the most effective in raising head diameter over the control treatment (98.4%) as pointed out in Table (6). The fresh and dry weight of sunflower heads significantly increased over the untreated control with spraying garlic cloves water extract by all concentrations. The stimulatory effect was most observable by using 15% of the extract. The results also reveal a significant increase in the weight of seeds/head (yield/plant) especially by spraying treatment with 15% (184.6% over untreated control). Data in Table (6) also reveal the highest significant increase in the weight of 100 seeds by spraying the extract with the concentration 15% reaching 72% over the unweeded control heads (yield/plant). However, purple nutsedge competition (untreated plants) reduced seed weight/head as well as weight of 100 seeds by 48.2% and 40.2% when compared by the healthy plants.

Table 3: Effect of spraying different concentrations of garlic cloves extract on the fresh and dry weight of foliage, fresh and dry weight of underground organs and total fresh and dry weight (g/plant) of purple nutsedge. (Average of the two seasons).

Treatments		Growth parameters											
Plants	% of garlic cloves extract	Fresh weight of				Total fresh weight (g/plant)		Dry weight of				Total dry weight (g/plant)	
		Foliage (g/plant)		Underground organs (g/plant))				Foliage (g/plant)		Underground organs (g/plant))			
		At 40 DAS	At harvest	At 40 DAS	At harvest	At 40 DAS	At harvest	At 40 DAS	At harvest	At 40 DAS	At harvest	At 40 DAS	At harvest
purple nutsedge (alone)	.....	15.70	22.50	4.43	20.0	20.13	42.50	3.85	7.25	2.51	10.41	6.36	17.66
purple nutsedge + sunflower	.....	10.54	15.10	2.69	9.9	13.23	25.00	2.60	4.89	1.46	5.73	4.06	10.62
purple nutsedge + sunflower	15	3.59	1.50	1.90	1.5	5.49	3.00	0.85	0.49	0.50	0.78	1.35	1.27
	30	2.33	0.32	0.74	0.6	3.07	0.92	0.60	0.11	0.35	0.30	0.95	0.41
	45	1.19	0.25	0.64	0.3	1.83	0.55	0.30	0.09	0.30	0.20	0.60	0.29
	60	0.32	0.22	0.00	0.0	0.32	0.22	0.10	0.07	0.00	0.00	0.10	0.07
LSD at 5%		0.98	1.82	0.37	1.15	1.19	1.36	0.49	0.50	0.15	0.52	0.66	0.82

Table 4: Effect of spraying different concentrations of garlic cloves extract on some growth parameters of sunflower at 40 days after sowing. (Average of the two seasons).

Treatments		Growth parameters			
Plants	% of garlic cloves extract	Plant height (cm)	No. of leaves/plant	Fresh weight of plant (g)	Dry weight of plant (g)
sunflower (alone)	.....	89.0	16.75	44.00	18.30
sunflower +purple nutsedge	.....	70.3	12.67	15.10	6.45
sunflower + purple nutsedge	15	100.0	17.33	57.17	27.30
	30	87.0	16.65	43.00	13.40
	45	81.5	16.33	36.28	11.90
	60	75.6	16.00	31.00	7.50
LSD at 5%		2.90	1.31	2.43	1.70

Table 5: Effect of spraying different concentrations of garlic cloves extract on some growth parameters of sunflower at harvest. (Average of the two seasons).

Treatments		Growth parameters			
Plants	%of garlic cloves extract	Plant height (cm)	No.of leaves/plant	Fresh weight of vegetative growth (g)	Dry weight of vegetative growth (g)
sunflower (alone)	.....	154.0	25.5	161.80	47.00
sunflower +purple nutsedge	.....	118.7	21.0	63.90	26.25
sunflower + purple nutsedge	15	169.7	27.7	180.00	50.40
	30	150.9	22.5	130.30	37.20
	45	140.5	21.9	100.25	33.05
	60	125.0	21.5	90.40	31.35
LSD at 5%		3.29	1.60	2.54	1.81

Table 6: Effect of spraying different concentrations of garlic cloves extract on yield and yield components of sunflower at harvest. (Average of the two seasons).

Treatments		Yield /plant				
Plants	% of garlic cloves extract	Head diameter (cm)	Fresh weight of head (g)	Dry weight of head (g)	Weight of seeds/head	Weight of 100 seeds (g)
sunflower (alone)	.....	11.50	74.5	16.18	10.06	3.83
sunflower +purple nutsedge	.....	6.25	25.7	7.50	5.21	2.29
sunflower + purple nutsedge	15	12.40	97.7	26.73	14.83	3.94
	30	11.00	58.4	12.60	9.06	3.11
	45	10.00	55.2	11.93	8.68	2.92
	60	9.00	45.6	9.72	7.45	2.84
LSD at 5%		1.54	2.78	1.46	1.12	0.65

Total phenols and flavonoids in the garlic extracts

The results in Table (7) show that the contents of both phenolic compounds and flavonoids in garlic seeds water extract is highly superior over their corresponding in garlic stalk water extract.

Table 7: Total phenols and flavonoids in the water extracts of both garlic cloves and stalk

Plant parts	Total phenols as mg/100g dry weight	Total flavonoids as mg /100g dry weight
Cloves	65.95	31.13
Stalk	14.76	10.24

IV. Discussion

Garlic (*Allium sativum* L.) extract is thought to be a good allelochemicals resource *(Wei et al., 2008 and Yuan et al., 2012).* Consequently can be efficiently reduce environmental pollution and realize good management in agricultural sustainable development.

The results of the current study indicate that garlic cloves water extract caused a significant reduction in the growth of mother shoots / tuber and the growth of daughter shoots as well as reduction in the growth of underground organs. Using the aqueous extracts of garlic cloves water extract at 45 and 60% caused a complete inhibition to underground tuber formation (Table 2). These results are in accordance with those reported by *(Xiao et al., 2012&2013; Xu et al., 2012 and 2013; Wang et al., 2014; Cheng et al., 2016; Ding et al., 2016 and Hayat et al., 2016).*

Previous studies carried out by our group using natural extracts of some plants suggested that the inhibitions in weed growth may be due to the presence of flavonoids and phenolic compounnds (El-Rokiek *et al*., 2017). Analysis of both cloves and stalk extract of garlic indicated that phenolic contents and flavonoids in the cloves are highly elevated over that in the stalk (Table 7) which could explain the inhibiting activity of garlic cloves extract.. In this connection, *El-Rokiek et al. (2016 and 2017)* suggested that the highly allelopathic herbicidal potential could be due to the high phenolic content in the extract. Onother work attributed the bioherbicidal potentials of the allelopathic extracat to the presence of phenolic acids *(Roby et al., 2013).*

The results indicated increase in the growth characters of sunflower plants which in turn lead increasing in yield and yield components (Tables 4-6). The increase in growth and yield was realized by spraying garlic seed water extract at all concentrations especially at the low concentration. Although a complete inhibition of purple nutsedge growth was obtained by the high concentrations, this inhibition was concomitant with increase in growth and yield of sunflower which was lower than the increase caused by low concentrations. In this connection, *Singh et al. (2005)* reported that Plants produce metabolites, which are inhibitor or stimulator depending on their concentrations and subsequently alter the growth and physiological functions of plants. Additive similar confirming results were obtained by *(Ahmad et al., 2013)* in pepper and *Xiao et al. (2013)* in cucumber. Additive confirming results were obtained on Squash and *Schefflera arboricola*, by El-*Desouky et al. (1998)* and *Hanafy et al. (2012).*

In general controlling weeds in crop plants decrease their competitions with associated weeds and consequently increase growth and yield of the target plants *(El-Masry et al 2015; Ahmed et al., 2016 and El-Rokiek et al., 2016 and 2017).*

V. Conclusion

The results suggest that treatment of sunflower plants with cloves water extract of garlic could be used as bio-herbicide for controlling purple nutsedge in sunflower beside its promoting activity at low concentrations.

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The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for Writing a Good Quality Science Frontier Research Paper

Techniques for writing a good quality Science Frontier Research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of science frontier then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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