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جامعة الأزهر
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والاستشارات الزراعية

المؤتمر الدولي
الثروة السمكية والأمن الغذائى في الدول العربية والإسلامية

في الفترة من ٢٢-٢٤ أكتوبر ٢٠٠٣م

تأثير استخدام نبات الأمبروزيا ماريتيما (الدمسيسة) على جودة المياه والكائنات الحية الدقيقة(البلانكتون النباتى والحيواني) في أحواض الاستزراع السمكي

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تأثير استخدام نبات الأمبروزيا ماريتيما (الدمسيسة) على جودة المياه والكائنات الحية الدقيقة(البلانكتون النباتى والحيواني) في أحواض الاستزراع السمكي

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قسم الاستزراع السمكى- المعمل المركزي لبحوث الثروة السمكية بالعباسة – مركز البحوث الزراعية

أجريت هذه الدراسة بالمعمل المركزي لبحوث الثروة السمكية بالعباسة-أبو حماد- محافظة الشرقية وكانت فترة الدراسة ١٥٠ يوم بهدف دراسة تأثير استخدام نبات الأمبروزيا ماريتيما (الدمسيسة) على جودة المياه وكذلك دراسة مجموعات البلانكتون النباتية والحيوانية. وقد أستخدم في هذه التجربة٨ أحوض من الأحواض الترابية مساحة الحوض ١٢٦٠م^{٢} قسمت إلي ٤مجموعات (معاملات) و تحتوى كل مجموعة على ٢ أحواض (مكررات) . وتم تسكين كثافتين من اسماك مبروك الحشائش (٤٠٠-٦٠٠) اصبعيةللحوض الواحد وقد وتم معاملة كل كثافة بمركز من اوراق نبات الدمسيسة المجففة أو بدون أستخدام . وكان من أهم النتائج المتحصل عليها ما يلي :

١-أعطت المعاملةالثانية التي أستخدم فيها مركز من اوراق نبات الدمسيسة المجففة متوسطات أكبر في درجات الحرارة يليها المعاملةالأولى ثم المعاملةالرابعة وكانت المعاملة الثالثة أقل المتوسطات في درجة الحرارة.

٢-أعطت كذلك المعاملة الأولىو الثانية التي أستخدم فيها مركز من اوراق نبات الدمسيسة المجففة متوسطات منخفضة نسبيا في درجة ال pH والقلوية عنها في أحواض المعاملة الثالثة والرابعة.

٣- أظهرت التحاليل أن متوسط أعداد الكائنات الحية الدقيقة النباتية (الفيتوبلانكتون) كانت أكبر ما يمكن في المعاملةالثانية التي أستخدم فيها مركز من اوراق نبات الدمسيسة المجففة يليها المعاملة الأولى ثم المعاملة الرابعة وأعطت المعاملة الثالثة أقل المتوسطات .وكانت مجموعة الطحالب الخضراء (الكلورفيتية) هي المجموعة السائدة في جميع الأحواض يليها الطحالب الخضراء المزرقة(السيانوفوتية) ثم الطحالب الخيطية (الباسيلاريوفتيه).

٤-أظهرت التحاليل أن متوسط أعداد الكائنات الحية الدقيقة الحيوانية (الزوبلانكتون) كانت أكبر ما يمكن في المعاملة الثانية التى أستخدم فيها مركز من أوراق نبات الدمسيسة المجففة يليها المعاملة الأولى ثم المعاملة الرابعة وأعطت المعاملة الثالثة أقل المتوسطات. وكانت مجموعة الروتيفر (الحومات) هي المجموعة السائدة في جميع الأحواض للمعاملات المختلفة يليها القشريات الصغيرة من فصيلة مفصليات الأرجل الكوبيبودا و الكلادوسرا

التوصيات

وتوصى الدراسة باستخدام مركز من اوراق نبات الدمسيسة المجففة (١٥ كـم/فـدان /شهر) في أحواض الاستزراع السمكي في النظام الأنتشارى لما له من أثر فعال فـي زيـادة المجموعات البلانكتونية (الفيتوبلانكتون والزوبلانكتون). كما ادى ذلك الى تحسـن الظـروف البيئية لتربية الأسماك فى الأحواض.

EFFECT OF DAMESISA PLANT (*Ambrosia maritima*) ON WATER QUALITY AND PLANKTON COMMUNITIES IN FISH PONDS

By

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Key words: Damesisa plant; water quality; plankton communities; earthen ponds

ABSTRACT

An experiment was carried out at the Central Laboratory for Aquaculture Research at Abbassa, Sharkia governorate, Egypt during one growing season for150 days in earthen ponds of growing grass carp(*Ctenopharyngodon idella*).. The objective of the study was to identify the prevailing water quality parameters and plankton communities in the fish ponds. Fingerlings averaging 10.27±0.24 to 13.42 ±0.43 g. in weight were stocked in 8 earthen ponds each of total area 1260 m² representing two stocking densities (400-600) fish/pond with each stocking density two treatments applied are (with and without) dried leaves concentrate of Damesisa plant (*Ambrosia maritima*). Each treatment was performed in duplicate. Results obtained can be summarized as follows

1-Water temperature in treatment ponds receiving leaves concentrate of Damesisa plant (*Ambrosia maritima*) was found to be higher than treatments without it.

2-Pond received leaves concentrate of Damesisa plant (*Ambrosia maritima*)showed decreases in pH and alkalinity values in water compared to the other ponds.

3-The total phytoplankton counts for treatments T_1SR_2; T_1SR_1; $T_2SR_4$and T_2SR_1were found to be 3570; 5850; 7500 and 10010 organism/ L, respectively on the average and Chlorophyta dominated to the other species.

4-The total zooplankton counts for treatments T_1SR_2; T_1SR_1; $T_2SR_4$and T_2SR_1were found to be 1906.7; 950; 903.3 and 738.3 organism/ L, respectively on the average and Rotifera dominated to the other species.. Based on the obtained results it could be recommended the use of leaves concentrate of Damesisa plant (*Ambrosia maritima*) in extensive fish production, thus it increased the plankton communities and improved environmental conditions in the water of fish ponds

INTRODCTION

Shoots of (*Ambrosia maritima L.*) fed to chickens at 2 and 10 percent of the basic diet for 6 weeks were not lethal. Average body weights and efficiency of feed utilization were markedly depressed in the chicks on feed with10 percent *Ambrosia,* while growth of chicks on 2 percent *Ambrosia* were promoted as compared with chicks on a control diet. Tissue recovery was in complete 3 weeks following withdrawal from the test diets containing *Ambrosia.* (Amel *et al*, 1996).

Abbas, *et al* (2002)recommended that, there is no toxic effect of Damesisa plant on fish moreover the studied plant improve the liver and kidney function and it may be need more further investigations to confirm the safe using of Damesisa in the aquaculture field.

Growth parameter of the three species (Tilapia, Mullet and Common carp) had improved with the applied Damesisa plant 1‰ level of artificial feeding 25% crude protein with lower stocking density (3100 fish/pond) and from the economical point of view, the stocking rate 6200 fish/feddan seemed to be the best in percentages of net return to total costs (Abdel-Rahman, *et al.*, 2003).

In fish ponds the physico-chemical characteristics of water and flora as primary production and nutritive fauna as secondary productive are well known in their relationship to fish production. These characteristics vary according to certain conditions prevailing in such ponds, which depend largely on the nature of soil and water. Furthermore, these properties might vary from a pond to another within the same farm, even if they have the same surface area and the water column as well. These variations are mostly due to the management technique, feeding and fertilization regimes, aeration, fish species and number of stock. The community composition of phytoplankton was studied in fresh water habitats, (Salah, 1959,in the Nouzha Hydrodrome; EL- Ayouty and Awwad, 1976,in the River Nile and Borhan, 1978,in Abbasa ponds). Meanwhile, Hutchinson (1957), EL-Hawary (1960), Elster and Jensen (1960), Borhan (1978) and Saleh (1986) studied the zooplankton community composition in different water habitats.

The present investigation was performed to study the effect of (with and without) dried leaves concentrate of Damesisa plant (*Ambrosia maritima*) on the development of the p anktonic communities and water quality parameters using fingerlings of grass carp and chemical properties of the plant under natural conditions in earthen ponds.

MATERIALS and METHODS

Experimental ponds;fish and plant material:

Plant material *Ambrosia maritima L.*, was obtained as dry plant material from Medicinal and Aromatic Plant Research Department Institute-Cairo-Egypt. The plant tissue was grounded to a fine powder with a mortar and pestle and then was applied by filling it in cotton bags which was fixed at the water inlets in amounts of 5kg/ month per pond (4g. /m³). Before the experimental start all ponds were drained completely and after that ponds were exposed to sunrays for 12 days till complete dryness. Ponds were then refilled with fresh water coming from Ismailia Nile branch through a canal to the experimental Station. Grass carp (***Ctenopharyngodon idella***) fish with average initial weights between 10.27± 0.24 to 13.42±0.43 g. were obtained from the El-Abbassa governmental fish hatchery, Sharkyia Governorate. Fish were transported in a plastic bags and after arrival to the experimental station, fish were adapted to the new conditions for one hours, then distributed randomly into eight ponds each of a total area 0.30 feddan to represent two stocking densities (400 and 600 fish/pond) and within each density (with and without plant material) were tested. Total water area of each pond was 1260m² water level was maintained at one-meter level throughout the whole experimental period (150 days). The experimental fish feeds mainly on floating and submerged vegetation as well as filamentous algae.

(Table 1) Composition of the experimental plant on dry matter basis.

Item	%
Dry matter	93.15
Organic matter	81.24
Crude fibers	20.64
Crude protein (C.P)	15.79
Ether extract (E.E)	2.7
Ash	18.76
NFE (Nitrogen free extract)	42.11

Samples and measurements:

Water temperature, dissolved oxygen and pH were measured daily at 6°°a.m. and 12°° p.m. using temperature and dissolved oxygen meter (YSI model 57) and pH meter (model Corning 345). Transparency and Turbidity were measured every two weeks by sicchi disk and (Hack) spectrophotometer (model 41700) using Hack kits respectively. Determinations of water quality parameters (salinity, alkalinity, total hardiness, phosphorus and ammonia were carried out every two weeks according to the methods of Boyd (1979). Phytoplankton and zooplankton communities in pond water were determined every two

weeks according to the methods described by Boyd (1990) and A.P.H.A (1985). Samples were collected from different sites of the experimental ponds randomly to represent the water of the whole pond. After 150 days of fish culture, grass carp was harvested from each pond in order to determined the total fish production.

Statistical analysis:

The statistical analysis of data was carried out by applying the computer program Harvey, (1990) by adopting the following fixed model.

$$\mathbf{Y_{ijk} = \mu + P_i + S_j + (PS)_{ij} + e_{ijk}}$$

Where:

Y_{ijk} = observation of the ijk- th fish

μ = overall mean

P_i = fixed effect of the i-th protein level

S_j = fixed effect of the j-th stocking density.

$(PS)_{ij}$ =interaction between the effect of i-th protein level and j-th stocking density

e_{ijk} = random error assumed to be independently randomly distributed $(0, \delta^2 e)$.

RESULTS and DISCUSSION

The water quality parameters

Physic characteristics:

Averages water quality parameters as affected by (with and without) dried leaves concentrate of Damesisa plant (*Ambrosia maritima*) is presented in table (2). Results revealed that Transparency (Sicchi disk reading in cm) had ranged between 14.5 cm (T_1SR_2 treatment) and 18.6 cm (T_2SR_2 treatment). These values are beneficial to fish cultivation. In this connection, Mahmoud (1997); EL-Gendy (1998) and Abdel-Hakim, *et al* (2000) reported that Sicchi disk reading was 14.1 cm and 15 cm.

Turbidity is one of the physical properties that are affected by fish used. It has been determined in FTU had ranged between 110 (T_2SR_1 treatment) and 125 (T_1SR_2 treatment) which show a similar trend.

The same trend was observed in water temperature when the average was found to be between 25 and 30C°(table 2). The higher difference values of water temperature in ponds received leaves concentrate of Damesisa plant (*Ambrosia maritima*) may be attribute to the increase in organic matter contents of these ponds that may lead to temperature increases. These are in agreement with results of Mahmoud (1997) and Abdel-Hakim, *et al* (2000) who reported a slight increase in

water temperature with increasing manure. Transparency, turbidity and temperature values are in the range recommended for the fish species cultured in the four treatments.

Chemical characteristics

Average of pH values for treatments T_1SR_1; T_1SR_2; $T_2SR_1$and T_2SR_2were 8.5; 8.2; 9.1 and 9.4 respectively. The lower values of pH in ponds received dried leaves concentrate of Damesisa plant (*Ambrosia maritima*). may be attributing to the increase in organic matter contents of these ponds, which may lead to pH decreases. Averages of dissolved oxygen (DO) have ranged between 6.0 to 7.5 mg/L. These values are beneficial to fish cultivation and indicate that water dissolved oxygen slight decreased in ponds received dried leaves concentrate of Damesisa plant (*Ambrosia maritima*). compared to the other ponds. This attribute to the increase in organic matter contents of these ponds, which may lead to DO decreases.

Averages of phosphorus had ranged between 1.2 and 1.5 mg/L, which represent the normal range of phosphorus in fishponds. In this connection Fortes *et al* (1986) and Abdel-Hakim, *et al* (2000) showed that the available phosphorus was significantly ($P \leq 0.01$) highest in the chicken manure feed combination. They added that there are indications that phosphorus content of chicken manure increased that in the soil, although total phosphorus in the soil contributed only about 0.8 % of that in water.

Averages of ammonia concentration (NH3), as affected with treatments in experimental ponds had ranged between 0.11 to 0.12 mg/L and lay in the normal range. These values are beneficial to fish cultivation and agreed with the findings of Robinette (1976) and Abdel-Hakim, *et al* (2000) who concluded that the toxic levels for unionized ammonia for short time exposure usually lie between 0.6 to 2.0 mg/L for pond fish.

Averages of Total alkalinity have ranged between 210 to 255 mg/L. The slight differences in values of total alkalinity in ponds received leaves concentrate of Damesisa plant (*Ambrosia maritima*) may be attributed to the increase in organic matter contents of these ponds.

Averages of Salinity had ranged between1.0g/L to1.2 g/L. These values showed no great variations and they lay in the range recommended for the fish species cultured in the four treatments. In this connection, Clay (1977) and Abdel-Hakim, *et al* (2000) showed that the highest concentration of salinity which permits normal survival and growth for *Oreochromis niloticus*, *O.aureus* and *S. mossampicus* lay between 24.0, 18.0, and 30 g/L for the three species respectively

Table (2): Averages of water quality parameters of ponds during the experiment (185).

Treatment	Day	Water depth /cm	Sicchi disk cm	Turbidity FTU	pH	D.O mg/L	Alkalinity mg/l ca co3	Salinity g/l	P2O5 mg/l	NH3 mg/l	Temperature C
T_1SR_1	150	100	16	113	8.5	7.2	225	1.0	1.48	0.11	28
T_1SR_2	150	100	14.5	125	8.2	7.5	210	1.1	1.56	0.12	30
T_2SR_1	150	100	17	110	9.1	6.2	240	1.2	1.32	0.10	25
T_2SR_2	150	100	18.6	112	9.4	6.0	255	1.2	1.21	0.10	27

T_1SR_1 Treatment (1) with received Damesisa plant (400 fish/pond)
T_1SR_2 Treatment (1) with received Damesisa plant (600 fish/pond)
T_2SR_1 Treatment (2) without received Damesisa plant (400 fish/pond)
T_2SR_2 Treatment (2) without received Damesisa plant (600 fish/pond)

Table (3): The phytoplankton organisms in the water of experiment.

Groups →	Green algae (Chlorophyta)	Blue-green algae (Cyanophyta)	Diatoms (Bacillariophyta)
Species ↓	*Closterium leblenii* *Ankistrodesmus falcatus* *Pediastrum simplex* *Chara canescens* *Scenedesmus quadricauda* *Spirogyra sp* *Stanrastrum tetraocrum*	*Merismopedia elegans* *Anabaena spiroides* *Nostoc prumiforme* *Oscillatoria rubescens* *Spirulina princeps* *Microcysdie aeroginosa*	*Melosira granulata* *Cyclotella meneghiniana* *Asterionella furmosa* *Navicula viridula* *Synedra ulna* *Nitzchia bilobata*

Table (4): Average numbers of phytoplankton 1n the water of experiment al ponds (organisms/ L).

Treatment	Total phytoplankton Org./L	phytoplankto (organism / L)		
		Cyanophyta	Chlorophyta	Bacillariophyta
Tr1 SR1	7178	2100	3500	1578
Tr1 SR2	10480	2500	6230	1750
Tr2 SR1	3973	912	1850	1211
Tr2 SR2	5955	1765	2857	1323

Table (5): Average numbers of zooplankton 1n the water of experimental ponds (organisms/ L).

Treatment	Total phytoplankton Org./L	zooplankton (organism / L)		
		Rotifer	Copepoda	Cladocera
Tr1 SR1	1184	590	296	298
Tr1 SR2	1710	800	510	400
Tr2 SR1	821	345	311	165
Tr2 SR2	1100	420	390	200

HYDRO-BIOLOGICAL FEATURES:

Plankton communities:

Phytoplankton:

Results presented in table (4) illustrate the effect of with or without dried leaves concentrate of Damesisa plant (*Ambrosia maritima*) on phytoplankton communities. The total phytoplankton counts for treatments T_1SR_1; T_1SR_2; $T_2SR_1$and T_2SR_2were fond to be 7178; 10480; 3973 and 5955 organism/ L, respectively on the average. The results of table (4) indicate that the highest phytoplankton values were obtained by the T_1SR_2 treatment followed in a decreasing order by $T_1SR_1$and $T_2SR_1$and T_2SR_2 treatments respectively. These results could be explained by the fact that organic matter has more fertilization potential compared with other treatments. In this hence table (1) revealed that duck manure contains 81.24% organic matter. This may reflect the better fertilization potential of dried leaves concentrate of Damesisa plant (*Ambrosia maritima*) compared to other ponds. Results presented in table (4) show that the average counts of Cyanophyta for treatments T_1SR_1; T_1SR_2; $T_2SR_1$and T_2SR_2 were 2100; 2500; 912 and 1762 organisms/L, respectively. Results of this table revealed that Cyanophyta counts as a percentage from the lowest treatment (T_2SR_1 treatment) and the highest treatment was T_1SR_2 followed by $T_1SR_1$and T_2SR_2treatments, respectively. Results presented in tables (4) revealed that Chlorophyta behaved seemlier to the Cyanophyto where the highest count was reported by the T_1SR_2 group followed in a decreasing order by T_1SR_1; T_2SR_2 and T_2SR_1 groups respectively. The same trend was also observed in the Baccillariophyta .

The present study indicates that Chlorophyta is the dominant group followed by Cyanophyta and Bacillariophyta in the all treatment ponds. This community
composition of phytoplankton reported in this study is in confirmation with observations of EL-Serafy and AL- Zahaby (1991), who pointed out that Chlorophyta predominated all the other groups followed by Cyanophyta and Bacillariophyta .On the other hand Salah (1959&1960), El-Ayouty and Awwad (1976) and Borhan (1978) gave different community compositions of phytoplankton in fish ponds compared to results of table (4) of the present study. Which may due to the differences in the ecological conditions of the ecosystems studied.

Zooplankton Results presented in table (5) illustrate the effect of with or without dried leaves concentrate of Damesisa plant

(*Ambrosia maritima*) on zooplankton communities in fishponds. The total zooplankton counts for treatments T_1SR_1; T_1SR_2; $T_2SR_1$and T_2SR_2 were fond to be 1184; 1710; 821 and 1100 organism/ L, respectively on the average. Results revealed that the lowest total zooplankton counts were obtained by the treatment T_2SR_1followed in an increasing order by T_2SR_2, B.M+F and T_1SR_1treatments, respectively. Results of table (5) revealed that the highest counts of Rotifera for treatments T_1SR_1; T_1SR_2; $T_2SR_1$and T_2SR_2 were fond to be 590; 800; 345and 420 organisms/L, respectively on the average.. Results of this table revealed that the highest counts of Copepoda for treatments T_1SR_1; T_1SR_2; $T_2SR_1$and T_2SR_2 were fond to be 296; 510; 311 and 390 organisms/L, respectively. Results presented in table (5) revealed that Cladocera behaved seemlier to the Copepoda.

The present study indicates that Rotifera is the dominant group followed by Copepoda and Cladocera in all the treatment ponds. This community composition of zooplankton is not in conformity with observations of EL-Serafy and AL- Zahaby (1991), where he pointed out that Copepoda was predominated all the other groups. These results may due to differences in the nature of the environmental conditions These results indicate that the community composition of phytoplankton and

Table (6) Effects of stocking density and Damesisa plant (*Ambrosia maritima*) on total fish production (Kg./Feddan)of grass carp.

Treatments	With receiving Damesisa plant		Without receiving Damesisa plant	
	SR1	SR2	SR1	SR2
Initial total biomass (Kg/Fed.)	13.55	26.84	13.64	26.22
Survival rate	99%	100%	100%	99%
Final total biomass (Kg/Fed.)	196.96	256.42	176.84	238.64
Weight gain (Kg/Fed.)	183.4	229.58	160.2	217.42
% of the smallest value	114.4%	143.3%	100%	135.7%

zooplankton in the all treatments ponds fluctuated greatly with temperature, fertilization. In this concern, Riely (1947) reported that statistically the relation of zooplankton and phytoplankton obtained no strict relationship between the total zooplankton and the total phytoplankton numbers (not significant).

Fish yield per Feddan:

Averages of initial biomass/ Feddan for the experimental groups T_1SR_1; T_1SR_2; $T_2SR_1$and T_2SR_2Were 13.55; 26.84; 13.64 and 26.22 kg. Respectively (table6). The differences among the experimental groups had due to the different stocking densities tested. Averages of final biomass/Fed. At the end of the experimental period were 196.96; 256.42; 176.84 and 238.64kg.for the same treatment groups cited above, respectively. Results of this table revealed that the final weight/Fed. Increased with increasing stocking density of grass carp in earthen pond and the increase were pronounced with application of Damesisa plant. The same trend was observed with the gain in weight / Fed.. As presented in table (6), Survival rate of grass carp was recorded to be 99% for groups T_1SR_1; T_2SR_2 and 100% for groups T_1SR_2, T_2SD_1, respectively. Indicating that neither stocking density nor application of Damesisa plant seemed to influence the survival rate of grass carp reared in earthen pond. These results are in agreement with the findings of Abdel- Hakim *et al.* (2000a) reported that pond yield of silver carp increased in a linear manner with each increase in manure level and stocking density.

CONCLUSION

Based on the obtained results it could be recommended the use of dried leaves concentrate of Damesisa plant (*Ambrosia maritima*) in extensive fish production, thus it increased the plankton communities and improved environmental conditions in the water of fish ponds

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