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Preliminary study of using groundwater for the culture of common carp fish *Cyprinus carpio* in southern Iraq

Jassim H. S.; Nibras N. A.; Amir A. J.

Marine Science Centre, University of Basra, Basra, Iraq

Jassimhameed14@yahoo.com

Abstract:

Common carp fish *Cyprinus carpio* were cultured in areas dependent on groundwater and other surface water with a weight rate of 10 grams in five basins, one of which is controlled and the others are groundwater. The fish growth was compared with a basin filled with surface water in al-Mutaiha area in southern Iraq.The chemical elements and environmental factors of water in ponds, including chloride, magnesium, calcium, potassium, sodium, sulfate, carbonate, salinity and pH, were measured. The growth parameters were calculated as the increase in weight and the qualitative and relative growth of cultured fish. The highest increase in weight of groundwater was 144 g, surface 164 g and specific growth (4.1% day) for surface water (3.1% day) for groundwater. It was found that there were no significant differences (P>

0.05) between fish growth (weight increase and qualitative and relative growth) cultured on groundwater and other cultivated on surface water.

Introduction:

There are three sources of water used in the breeding of fresh water fish. The first is the spring or groundwater, which is often the most desirable due to its proven temperature and pollution. The second source is the lake water which gives good specifications for fish breeding because of its large sizes, but the number of lakes in the world is not that big, and the third source is the waters of streams and rivers, which are exposed to environmental factors and pollution, which lead to poor quality of water(Stickney, 1991).

Groundwater is characterized by its lack of other sources, as it is warmer when the air temperature is low, especially in the winter, and the temperature drops in the summer (Flowers and Hutch, 2005).Groundwater is distinguished from other sources, with high temperature when the air temperature is low, especially in the winter, and the temperature drops down in the summer (Flowers and Hutch, 2005).

China's groundwater was widely used for fish farming, as carp fish were successfully cultivated (Kankam-Yeboah, 1987).Flowers andHutchinson (2004) found that ground water is suitable for the cultivation of many species of fish (*Pagrus auratus; Acanthopagrus butchen; Sillaginodes punctata*).

Suloma and Ogata (2006) noted that African countries have played a major role in increasing fish production by using fish farming systems with rice fields as well as desert culture on groundwater.

Curry *et al*. (1995) also used groundwater in the nursery of trout *Saleinus fontinalis*. Mohammadi *et al*. (2011) used ground water to reproduce and cultivate the trout*Oncorhynchus mykiss* larvae in the Yazd desert in Iran.

The composition of surface water is different than groundwater in salinity, as well as in terms of the quantity and quality of salts. Potassium content in groundwater is between 60-100% (Fielder*et al*., 2001). In a study ofDorousdi *et al*. (2006) on the effect of salinity and potassium on the survival of young *Aroursomus japonicus* in saline groundwater. The highest survival rate was found in salinity of 14 g / L and 38% potassium concentration. The lowest survival rate was obtained at salinity of 7 g / L and 33 g / L And 25% potassium concentration.

The high salinity of fresh water leads to the invalidity of the water to raise freshwater fish, and this actually happened in the waters of the Shatt al-Arab, which led to the destruction of the fish of many farms in the areas of Faw and Abu al-Khasib. Therefore, there was a need to find an alternative to such water, such as the use of groundwater in desert areas, despite the harsh living conditions in those areas. In the absence of studies in Iraq on fish farming on groundwater, this study was conducted for the first time.

Methodology:

In a desert area in the Province of Basra / southern of Iraq, several ponds have been established, first pond is located in the poultry area in Al-Zubair district, second pond is located in Safwan area, third pond is located in Shuaiba area, and fourth pond is located in Al-Rraha area. Common carp fish were farmed with a rate of one fish/m^3. Total number of cultured fish was 4110 fish and the total cultivated area was 4090 m^2. A fifth pond (control) was established in al-Mutaiha area south of Basra.

It provided surface water from Shatt al-Arab, fish culturing in all five ponds had started at the same time. These ponds were considered as experimental basins before starting a major project.

The four ponds were filled with groundwater from wells in tomato farms, while the fifth pond was filled with surface water from Shatt al-Arab. Water samples were taken to the laboratory, and the environmental, chemical, and physical factors of the pond water were measured. Fountains or water drop from high place to ponds in a form similar to waterfalls were used to increase the concentration of dissolved oxygen. Fish weights weremonthly measured by a field balance to the closest 0.1g. The fish were dailyfed with 5% of the body weight, with a diet was manufactured in the feed processing laboratory at Marine Sciences Center. The percentages of its components are listed in Table (1), with 25% protein.

Table (1): Ingredients of the food diet used in fish feeding.

Food ingredient	**Proportion%**
Fish Powder	20
Wheat Flour	20
Wheat bran	20
A rice loaf	10
Barley	10
Rice	10
Soybean	9
Calcium + vitamins	1

To estimate the growth of cultured fish in the first and fifth basins, the parameters of specific growth, relative growth and weight gain were used. The specific growth rate (SGR) was measured according to the equation cited by Jobling and Koskela (1996).

$$SGR = \frac{(Lnw_2 - Lnw_1)}{(t_2 - t_1)} \times 100$$

As:

W1 = weight (mg) of fish at the beginning of the experiment

W2 = weight (mg) of fish at the end of the experiment

T2 - t1 = number of trial days.

Relative Growth Rate (RGR) according to the formula cited by Utne (1978):

$$RGR = \frac{w1w2 -}{w1} \times 100$$

The Statistical Package for Social Sciences (SPSS) was used to analyze data according to Complete Randomized Design CRD and used the Least Significant Differences LSD to test the level of significance between transactions at 0.05.

Results:

Environmental Properties:

Table (1) shows the environmental and chemical properties of groundwater used in cultivated ponds in various areas in the desert of Basra. The water of ponds from wells (pond 1, pond 2, pond 3, pond 4) contains high concentrations of dissolved materials, while (Control pond) contain low concentrations of dissolved materials. The concentration of dissolved oxygen was low during the process of extracting water from the well, as it precipitated 2 g / L, but after its release and touch the air, it gradually rising to be suitable for culture.

Table (2): Chemical measurements of groundwater used in the culture of common carp fish.

Chemical material	Ponds				
	Pond 1	Pond 2	Pond 3	Pond 4	Pond 5
Chloride	3493.95	3740.67	3527.33	2933.45	837.50
Calcium	632	588	495.43	482.38	80.00
Magnesium	174.94	150.56	161.28	168.87	72.90
Sodium	840.66	782.98	791.56	877.44	351
Potassium	39.45	37.67	40.80	39.69	13.67
Sulfates	2309.55	2287.70	2498	2265.90	234.15
Carbonates	931.80	869.78	850.11	849.48	483.46
Salinity	5.33	3.56	1.72	4.86	2.40
Oxygen	6.00	6.02	6.83	6.54	6.31
PH	8.12	8.11	8.2	7.94	7.31

Growth:

Table (3): Common carp fish ponds used in the study.

Pond No.	Site	Used water type	Primary weight rate	final weight rate
Pond 1	Al-Zubair	Groundwater	10	559
Pond 2	Safwan	Groundwater	10	344
Pond 3	Shuaiba	Groundwater	20	700
Pond 4	Al-Rraha	Groundwater	10	250
Pond 5	Al-Mutaiha	Surface water	10	623

Table (3) shows the ponds in which the common carp fish were farmed, their area, number of fish farmed, and primary and final fish weight rates.

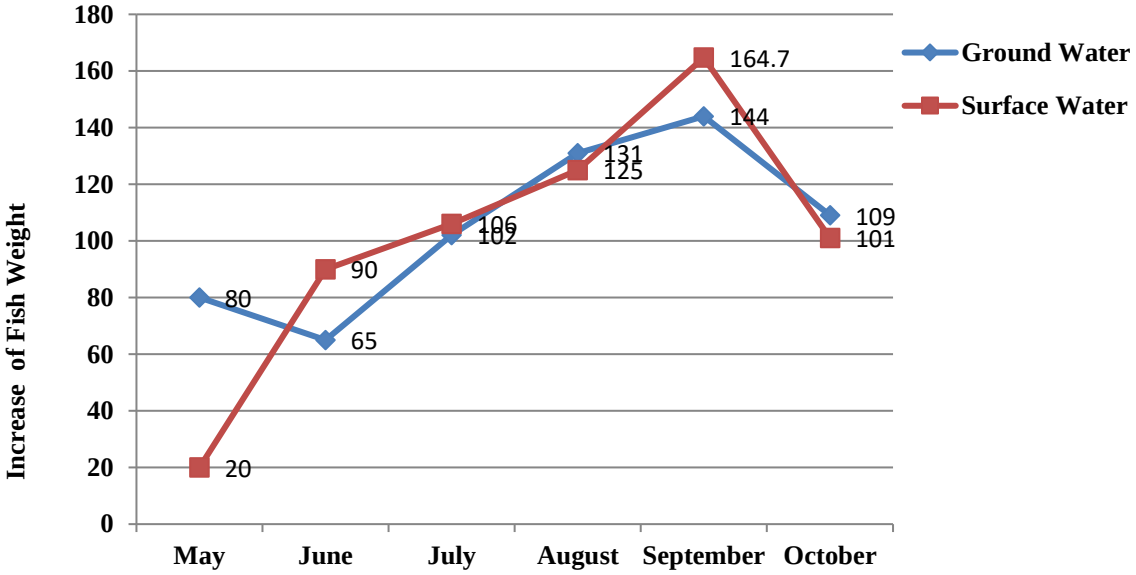

Figure (1) Shows the monthly changes of the increase in the weight of common carp fish grown on the ground and surface water.

Figure (1) shows the monthly changes of the increase in the weight of common carp fish grown on the ground and surface water cultivated in the first and fifth ponds, noting that there is no significant difference (P> 0.05) in the growth of fish between the two environments during the different months.

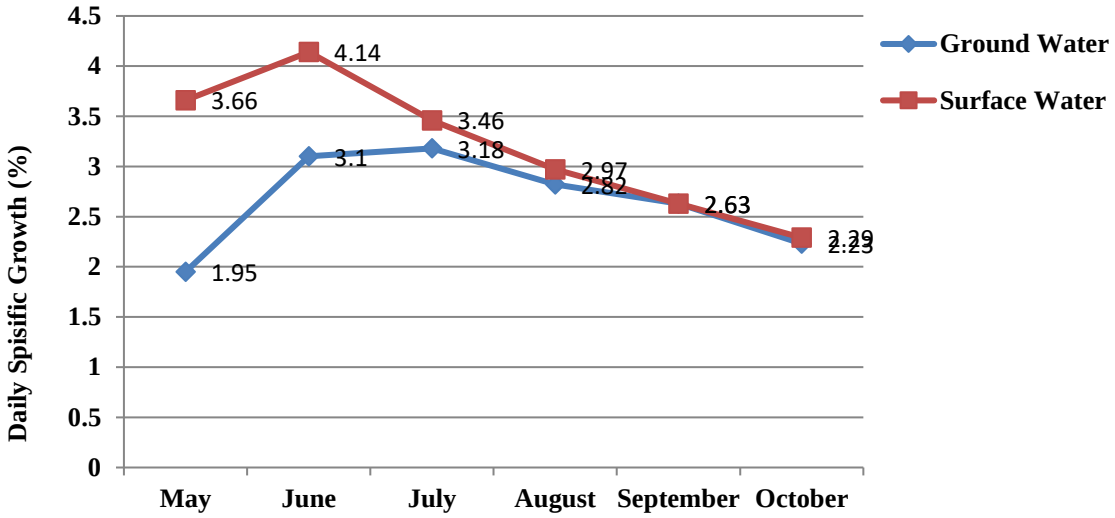

Figure (2): Daily specific growth of common carp fish cultured on groundwater and surface water.

As shown in Fig. 2, there is a high specific growth during May and June (3.66% / day, 4.14% / day, respectively) for common carp fish farmed in surface waters (Pond 5), while fish farmed on groundwater (Pond 1) Received high specific growth during June (3.10% / day and 3.18% / day), respectively.

The results show no significant differences (P> 0.05) in the relative growth of cultured fish on groundwater and cultured fish on surface water during the months of the experiment (Fig. 3).

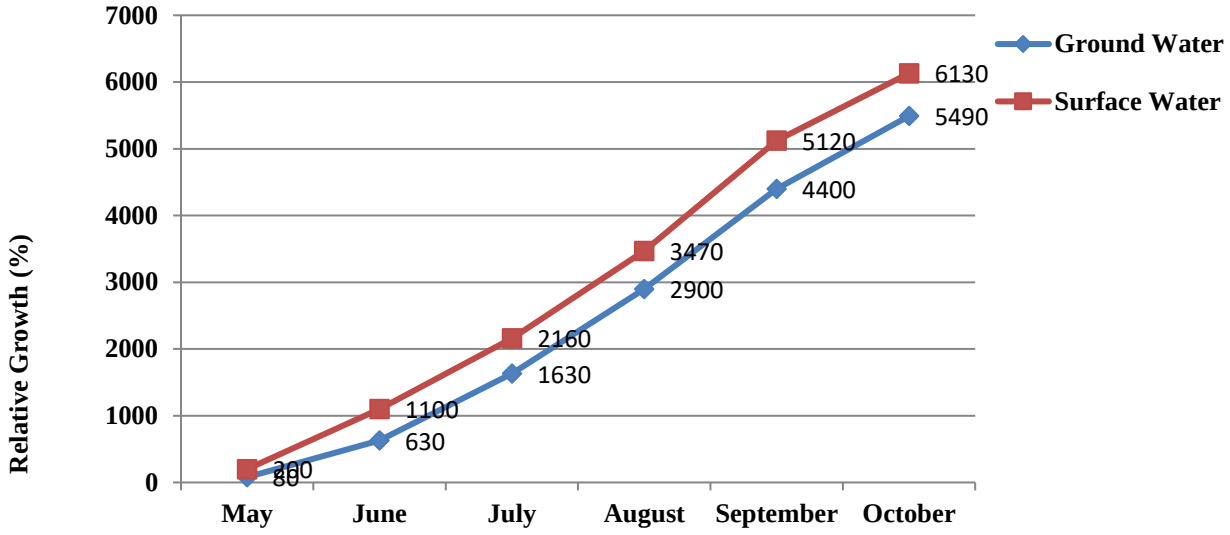

Figure (3): Relative growth of common carp fish cultured on groundwater and surface water.

Discussion:

Someof them may surprise by fish farming in the desert areas, because of the environmental aspects of these areas that are far from fish farming in terms of the quantity and quality of groundwater. It is an important source of water then we have to maintain it withoptimal utilization. The process of fish farming in the desert has recently been exploited by the same quantity or less for the use of plant production to give more benefit for the farmers in the desert.

Groundwater is one of the best types of water for fish farming, especially microbiologically, because it is free of any pathogens as well as not containing any contaminants, such as plant or animal organisms or some undesirable fish species that can be transferred to basins with water from other water sources.

The results of the study show that the concentration of chemical compounds of groundwater is higher than in surface water, and this is consistent with Mohammadi *et al*. (2011).

The best and easiest way to test the aquifer's viability of fish farming may be by conducting a narrow-scale study to culture a certain number of fish to identify their potential for growth in such water, which is what actually happened in our this study.

In terms of the parameters of the growth of common carp fish (weight increase, specific growth and relative growth)in this study, there were no significant differences between cultured fish in the groundwater and the other cultivated in surface water. This indicates that desert areas in southern Iraq contain valid groundwater for the cultivation of freshwater fish, particularly common carp fish.

The results indicate that common carp fish farmed in fresh groundwater gave good growth as in fresh surface waters during the same period andthis may due to high temperature of groundwater (when the air temperature is low, especially in the winter) and the temperature drops in the summer (Flowers and Hutch , 2005), since the warm groundwater during the winter gives a longer chance for fish for longer feeding period than it in surface water, as shown in Abbas *et al*. (2010) when cultured common carp fish on ground water for one year and obtained a total weight of 1119 g.

Kankam - Yeboah (1987) stated that fresh groundwater is suitable for the cultivation of common carp fish. Groundwater is contenting a high potassium content which helps in a positive effect on the growth and survival of fish (Dorousdi *et al*., 2006).

References:

Abbas, S. ; Ahmed, I. ; Salim, M. and Rehman,K.(2010). Comparative Effect of Fertilization and Supplementary Feed on Growth Performance of Three Species. *International Journal of Agriculture and Biology*. P:276-280.

Doroudi M.S., Fielder D.S., Allan, G.L and Webster G.K (2006) Combined effects of salinity and potassium concentration on juvenile mulloway (*Argyrosomus japonicus*, Temminck and Schlegel) in saline groundwater. *Aquaculture Research,* 37: 1034- 1039.

Curry, R. A. ; Noakes, D. L. G. and Morgan, G. E. (1995). Canadian *Journal of Fisheries and Aquatic Science*. 52(8):1741-1794.

Fielder, D. S., Bardsley W.J and Allan G.L (2001) Survival and growth of Australian snapper,*Pagrus auratus*, in saline groundwater from inland New SouWales,Australia.*Aquaculture* 201: 73-90.

Flowers, T.J .and Hutchinson, W. G.(2004). Productive uses for Saline groundwater using semi-intensive integrated aquaculture. CNRM project. No. 2002/016.

Flowers, T.J and Hutchinson, W.G (2005). of the effects of air extraction fans to ventilate aquaculture polytunnels at the Cooke Plains Inland Saline Aquaculture Centre, South Australia. National inland aquaculture coordination project milestone report, 19pp.

Kankam-Yeboah, K. (1987) Status report on the pilot scheme on groundwater utilization in the Accra Plains. Unpublished technical report, Water Resources Research Institute, Accra, Ghana.

Mohammadi. M. ; Sarsangi, H. ; Askari, M. ; Bitaraf, A. ; Mashaii, N. ; Rajabipour, F. and Alizadeh, M. (2011). Use of Underground Brackish Water for Reproduction and Larviculture of Rainbow Trout, *Oncorhynchus mykiss*. *Journal of Applied Aquaculture*, 23:103–111.

Stickney, R.R. (1991). *Culture of Salmonid Fishes. School of Fisheries.* University of Washington, Seattle, Washington. P52.

Suloma, A. and Ogata, H. Y. (2005). Future of Rice- Fish Culture, Desert Aquaculture and Feed Development in Africa: That case of Egypt as the leading Country in Africa. JARQ 40 (4), 351-360.

Jobling M. and Koskela (1996). Interindividual variations in feeding and growth in rainbow trout during restricted feeding and in a subsequent period of compensatory growth. Journal of Fish Biology, Volume 49, Issue 4
Pages 561–762.

Utne, F. (1978). Stard methods teminoology in fin- fish nutrition-form: Proc. World Symp.On Fin Fish Nutrition feed Technology , Hamburg. 20-30. June 1978.Vol.2.