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# The Suitable for Aquaculture Water Source Research and Water Quality Parameters in the Some Cities in the Gap Regions

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**Abstract:** In the culturel production aquaculture, first physical and chemical have suitable for flow owner a water source and ecological factor minimal level effection an appropriate to occupy a place. In this research Adiyaman, Diyarbakir, Gaziantep, Kilis and Sanliurfa cities were 25 L/sn and have more flow stream, river and source water for aquaculture production water source and in order to production appropriate to occupt a place.

**Key words:** GAP region, water sources, water quality parameters, aquaculture, appropriate place, appropriate to occupt

## INTRODUCTION

Humanbeings look for new sources of food because world population is ever increasing. Fish and other aquatic products are among these food sources because of the proteins they contain. In order to make use of natural resources in the best possible way today, new detailed were needed and basic information to be obtained from researches about these resources (Yuksel and Celayir, 2010).

The idea of consuming aquatic products of course, brings with it the idea of breeding them. Water and soil qualities and other environmental characteristics play an important role especially at the stage of planning in culture fish breeding. Because a well-planned and well-run fish breeding farm encourages the establishment of other farms. For this reason, it is essential that the water source qualities and the characteristics of the place the fish breeding facility is intended to be built are investigated thoroughly (Atay, 1990; Celikkkale, 1994; Ekingen, 1983; Kurum *et al*., 1998).

The waters used in aquaculture are the most suitable ones of springs, lakes and underground waters. Spring waters usually are poor in oxygen and contain harmful gases as well. They don't carry parasites and pathogens and aren't contaminated by rain water and floods. Although, the oxygen content of streams are high, they may contain residues of agricultural pesticides if they carry flood waters. If streams are to be used in breeding, the water course from the spring upto the breeding facility must be examined closely. It must be known if contaminant water from residences or factories are mixed with it. Besides, the flowrates of the stream at its highest and lowest throughout the year and how long it flows turbid must be known. The structural characteristics of the landscape the stream is flowing through, the conditions of the secondary streams merging into it, the physical and chemical features of the water and the food content of the water are also very important (Akyurt, 1979; Alpbaz and Hossucu, 1996; Claude, 1982; Celikkale, 1994; Ozdemir and Sunlu, 1996; Svobodova *et al*., 1993; Tuncay, 1994; Yaramaz, 1992).

The place of the breeding facility must be chosen very carefully. If a fish breeding facility is to be built, it either must have enough water resources to meet the demands or it must be built close to a water source. It must include natural or man made dikes or drainage channels against floods. The grounds must be large enough and mustn't be exposed to the winds. There must be no big rocks, stones and tree stubs. There must be a natural slope on the grounds which facilitates water's flow towards the facilities. The facilities must be in a place which makes its transportation to markets easy and cheap (Atay, 1990; Celikkkale, 1994; Ekingen, 1983; Kurum *et al*., 1998).

## MATERIALS AND METHODS

The research was conducted in the form of determining the water sources (brooks, streams, rivers and spring waters) with 25 L/sn and higher flowrates in Adiyaman, Diyarbakir, Gaziantep, Kilis and Sanliurfa and their villages and counties. Detailed information were obtained from the government institutions which had done researches about water resources in these places, this information was written down and field studies were planned. In the field studies and technical surveys, the physical and chemical features (turbidity, colour, water

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Table 1: The suitable for aquaculture water sources and measured some water quality value in the Adiyaman city

| City Adiyaman | Name of water source | Flow (L/sn) Mak-Min | Water heat (°C) | pH | Conductivite (mV) | Hardness $CaCO_3$ (mg $L^{-1}$) | Iron (mg $L^{-1}$) | Nitrite (mg $L^{-1}$) | Nitrate (mg $L^{-1}$) | Free Oxygen (mg $L^{-1}$) | Chlorin (mg $L^{-1}$) | Carbon dioxide $CO_2$ (mg $L^{-1}$) | Ammonia $NH_3$ (mg $L^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Celikhan center | Zebran fount | 300-500 | 10.3 | 7.8 | 206 | 8 | 0 | 0 | 2 | 11.5 | 0.01 | 0.5 | 0.0 |
| Celikhan center | Hapseri source | 500-1000 | 10.3 | 7.8 | 206 | 8 | 0 | 0 | 2 | 11.5 | 0.01 | 0.5 | 0.0 |
| Gerger Su Tape village | Hizori fount | 100-150 | 11.4 | 7.4 | 226 | 10 | 0 | 0.1 | 2 | 9.3 | 0.01 | 0.5 | 0.0 |
| Gerger Gurdalli village | Horrik fount | 30-50 | 10.4 | 7.9 | 195 | 9 | 0 | 0.1 | 5 | 8.5 | 0.01 | 0.7 | 0.0 |
| Gerger Gurdulli village | Kirkgoze source | 200+250 | 12 | 7.9 | 210 | 8 | 0 | 0 | 9.3 | 11.4 | 0.01 | 0.5 | 0.0 |
| Gerger Kutuklu village | Omeraga fount | 70-100 | 12 | 7.9 | 220 | 11 | 0 | 0.1 | 8 | 8.5 | 0.02 | 0.6 | 0.0 |
| Kahta Kocahisar | Degirmenbasi source | 250-350 | 12.1 | 8.1 | 196 | 6 | 0 | 0.1 | 1.0 | 10.8 | 0.02 | 0.5 | 0.0 |
| Kahta Eski Kahta | Kahta stream | 1500-3000 | 10.9 | 8.2 | 229 | 80 | 0.1 | 0.1 | 6 | 10.8 | 0.02 | 0.7 | 0.0 |
| Kahta center | Kalburcu stream | 1000-1500 | 13.5 | 8.4 | 345 | 81 | 0 | 0.1 | 8 | 11.5 | 0.19 | 0.2 | 0.1 |
| Besni Asagi Sogutlu | Tavas source | 500-700 | 15 | 7.1 | 411 | 19 | 0 | 0 | 8 | 12 | 0.02 | 0.7 | 0.0 |
| Besni Eski village | Sugozu source | 4000-5000 | 15.5 | 7.2 | 390 | 66 | 0 | 0.2 | 20 | 11.6 | 0.03 | 0.9 | 0.0 |
| Besni Kargali village | Kargali fount | 150-200 | 17.2 | 7.3 | 257 | 8 | 0 | 0.1 | 5 | 7.8 | 0.02 | 0.5 | 0.0 |
| Adyaman center | Gurlevik source | 200-250 | 8.3 | 7.6 | 173 | 112 | 0 | 0 | 18 | 11.5 | 0.02 | 0.4 | 0.0 |
| Adiyaman center | Ziyaret stream | 750-1000 | 12.7 | 8.3 | 330 | 9 | 0 | 0.1 | 15 | 10.8 | 0.16 | 0.9 | 0.2 |

Table 2: The suitable for aquaculture water sources and measured some water quality value in the Gaziantep city

| City Gaziantep | Name of water source | Flow (L/sn) Mak-Min | Water heat (°C) | pH | Conductivite (mV) | Hardness $CaCO_3$ (mg $L^{-1}$) | Iron (mg $L^{-1}$) | Nitrite (mg $L^{-1}$) | Nitrate (mg $L^{-1}$) | Free Oxygen (mg $L^{-1}$) | Chlorin (mg $L^{-1}$) | Carbon dioxide $CO_2$ (mg $L^{-1}$) | Ammonia $NH_3$ (mg $L^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Yavuzeli Saribugday Village | Halilbas fount | 30-50 | 18.1 | 7.3 | 470 | 67 | 0.03 | 0.2 | 13 | 5.9 | 0.01 | 0.5 | 0.01 |
| Yavuzeli Kuzuyatagi | Kirkgoz source | 100-150 | 20.6 | 7.1 | 517 | 33 | 0.01 | 0 | 7 | 6.8 | 0.02 | 0.5 | 0.01 |
| Yavuzeli Kuzuyatagi | Merzimen stream | 300-500 | 20.7 | 7.3 | 504 | 21 | 1.04 | 0.1 | 15 | 6.8 | 0.01 | 0.5 | 0.02 |
| Yavuzeli Cimenli | Karapinar source | 300-450 | 19.1 | 7.4 | 451 | 20 | 0.09 | 0 | 10 | 5.1 | 0.02 | 0.6 | 0.01 |
| Araban Gecehoyuk | Karasu stream | 400-500 | 23.8 | 6.7 | 440 | 37 | 0.05 | 0.1 | 11 | 7.1 | 0.0 | 0.7 | 0.01 |
| Araban Gumuspinar | Sitma fount | 75-100 | 20.2 | 6.5 | 482 | 32 | 0.06 | 0.1 | 8.8 | 6.4 | 0.10 | 0.7 | 0.01 |
| Araban Center | Ardil stream | 400-500 | 24 | 8.4 | 448 | 36 | 0.05 | 0.09 | 9 | 6.8 | 0.01 | 0.2 | 0.01 |
| Oguzeli Asmacik | Hoyuk fount | 40-50 | 17.4 | 7.4 | 585 | 16 | 0.23 | 0.06 | 12 | 7.4 | 0.16 | 0.5 | 0.2 |
| Oguzeli Karpuzatan | Karpuzatan source | 350-450 | 17.0 | 7.2 | 616 | 17 | 0.01 | 0.1 | 12 | 7.3 | 0.02 | 0.5 | 0.1 |
| Oguzeli | Kirkgoz | 90-150 | 17.6 | 7.3 | 440 | 10 | 0.01 | 0.1 | 11 | 7.1 | 0.01 | 0.4 | 0.1 |

Table 2: Continued

| City Gaziantep | Name of water source | Flow (L/sn) Mak-Min | Water heat (°C) | pH | Conductivite (mV) | Hardness $CaCO_3$ (mg $L^{-1}$) | Iron (mg $L^{-1}$) | Nitrite (mg $L^{-1}$) | Nitrate (mg $L^{-1}$) | Free Oxygen (mg $L^{-1}$) | Chlorin (mg $L^{-1}$) | Carbon dioxide $CO_2$ (mg $L^{-1}$) | Ammonia $NH_3$ (mg $L^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sazgin | source | | | | | | | | | | | | |
| Oguzeli Sutlice | Aynafar sources | 400-500 | 17.1 | 7.3 | 450 | 18 | 0.02 | 0.1 | 9 | 6.2 | 0.01 | 0.7 | 0.1 |
| Oguzeli Tuzel | Tüzel stream | 200-250 | 17.4 | 7.8 | 448 | 20 | 0.23 | 0.2 | 10 | 7.1 | 0.01 | 0.7 | 0.2 |
| Nizip Adakli | Keret sources | 50-70 | 17.2 | 7.3 | 545 | 16 | 0.20 | 0.09 | 12 | 5.5 | 0.11 | 0.7 | 0.1 |
| Islahiye Center | Gozbasi source | 100-150 | 14.5 | 7.3 | 425 | 20 | 0.04 | 0.08 | 10 | 7.2 | 0.13 | 0.7 | 0.1 |
| Islahiye Kayabasi | Kayabasi source | 100-150 | 13.5 | 7.1 | 194 | 14 | 0.08 | 0.1 | 0 | 7.3 | 0.10 | 0.2 | 0.1 |
| Islahiye Kayabasi | Bordelik source | 40-70 | 12.8 | 7.5 | 192 | 30 | 0.05 | 0.1 | 2 | 8.0 | 0.2 | 0.1 | 0.1 |
| Nurdagi Hisar | Kakurt gozu source | 25-30 | 15.8 | 7.1 | 486 | 20 | 0.1 | 0.1 | 10 | 7.5 | 0.1 | 0.6 | 0.1 |

Table 3: The suitable for aquaculture water sources and measured some water quality value in the Kilis city

| City kilis | Name of water source | Flow (L/sn) Mak-Min | Water heat (°C) | pH | Conductivite (mV) | Hardness $CaCO_3$ (mg $L^{-1}$) | Iron (mg $L^{-1}$) | Nitrite (mg $L^{-1}$) | Nitrate (mg $L^{-1}$) | Free Oxygen (mg $L^{-1}$) | Clorur (mg $L^{-1}$) | Carbon dioxide $CO_2$ (mg $L^{-1}$) | Ammonia $NH_3$ (mg $L^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Musabeyli Asagi kalecik | Afrin Cayi | 350-500 | 16.7 | 8.3 | 540 | 35 | 0.1 | 0.1 | 3.5 | 4.0 | 0.15 | 0.1 | 0.1 |
| Musabeyli Gunesli | Sabun suyu deresi | 70-100 | 19 | 8.6 | 720 | 75 | 0.09 | 0.1 | 25 | 3.8 | 0.06 | 0.7 | 0.1 |
| Merkez Kazikli | Balik suyu | 30-45 | 20.3 | 8.1 | 591 | 74 | 0.2 | 0.1 | 23 | 5.5 | 0.2 | 0.1 | 0.1 |
| Merkez Kucukkonak | Sunnep suyu | 30-40 | 20.7 | 8.1 | 620 | 80 | 0.2 | 0.1 | 26 | 5.5 | 0.2 | 0.1 | 0.2 |

Table 4: The suitable for aquacultur water sources and measured somr water quality value in the City

| City Sanliurfa | Name of water source | Flow (L/sn) Mak-Min | Water heat (°C) | pH | Conductivite (mV) | Hardness $CaCO_3$ (mg $L^{-1}$) | Iron (mg $L^{-1}$) | Nitrite (mg $L^{-1}$) | Nitrate (mg $L^{-1}$) | Free Oxygen (mg $L^{-1}$) | Clorur (mg $L^{-1}$) | Carbon dioxide $CO_2$ (mg $L^{-1}$) | Ammonia $NH_3$ (mg $L^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hilvan Golebakan | Golebakan sources | 100-170 | 18,1 | 7.7 | 370 | 37 | 0.04 | 0.1 | 10.5 | 6.9 | 0.08 | 0.4 | 0.1 |
| Siverek Gulluce | Gulluce sources | 30-55 | 16.3 | 7.3 | 250 | 5 | 0.0 | 0.0 | 0.0 | 7.8 | 0.01 | 0.3 | 0.0 |
| Siverek Center | Sampinar sources | 15-25 | 18.3 | 7.8 | 375 | 60 | 0.04 | 0.2 | 15 | 6.9 | 0.01 | 0.5 | 0.01 |
| Siverek Yalankoz | Yalankoz source | 15-25 | 18.1 | 7.8 | 147 | 22 | 0.02 | 0.2 | 15 | 6.9 | 0.01 | 0.3 | 0.01 |
| Bozova center | Kucukgol sources | 35-50 | 26 | 8.2 | 190 | 10 | 0.02 | 0.02 | 15 | 6.4 | 0.01 | 0.6 | 0.01 |
| Bozova center | Büyükgöl sources | 45-70 | 25 | 7.9 | 220 | 25 | 0.04 | 0.2 | 25 | 6.1 | 0.02 | 0.7 | 0.01 |
| Halfeti center | Degirmendere sources | 15-25 | 24 | 8.3 | 381 | 7 | 0.04 | 0.2 | 17.2 | 5.9 | 0.01 | 0.2 | 0.01 |
| Halfeti Fistikozu | Fistikozu source | 15-25 | 25 | 7.6 | 400 | 25 | 0.02 | 0.2 | 18 | 6.9 | 0.01 | 0.5 | 0.01 |
| Harran Tahilalan | Tahilalan source | 15-25 | 24 | 8.5 | 385 | 20 | 0.04 | 0.08 | 25 | 5.8 | 0.01 | 0.6 | 0.02 |

Table 5: The suitable for aquacuture water sources and measured some water quality value in the Diyarbakir city

| City Diyarbakir | Name of water source | Flow (L/sn) Mak-Min | Water heat (°C) | pH | Conductivite (mV) | Hardness $CaCO_3$ (mg $L^{-1}$) | Iron (mg $L^{-1}$) | Nitrite (mg $L^{-1}$) | Nitrate (mg $L^{-1}$) | Free Oxygen (mg $L^{-1}$) | Clorur (mg $L^{-1}$) | Carbon dioxide $CO_2$ (mg $L^{-1}$) | Ammonia $NH_3$ (mg $L^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Çinar Yarimkas | Yarimkas sources | 30-50 | 17.1 | 7.6 | 150 | 53 | 0.04 | 0.1 | 9.7 | 6.8 | 0.01 | 0.2 | 0.01 |
| Çinar Yarimkas | Bas Madrap sources | 40-60 | 17.1 | 7.6 | 170 | 27 | 0.04 | 0.0 | 13.5 | 6.9 | 0.08 | 0.3 | 0.01 |

Table 5: L Continued

| City Diyarbakir | Name of water source | Flow (L/sn) Mak-Min | Water heat (°C) | pH | Conductivite (mV) | Hardness $CaCO_3$ (mg $L^{-1}$) | Iron (mg $L^{-1}$) | Nitrite (mg $L^{-1}$) | Nitrate (mg $L^{-1}$) | Free Oxygen (mg $L^{-1}$) | Clorur (mg $L^{-1}$) | Carbon dioxide $CO_2$ (mg $L^{-1}$) | Ammonia $NH_3$ (mg $L^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Çinar | Bellitas | 50-70 | 10.1 | 7.3 | 130 | 67 | 0.0 | 0.0 | 7.6 | 7.8 | 0.02 | 0.2 | 0.01 |
| Bellitas | sources | | | | | | | | | | | | |
| Center | Pamukçay | 150-200 | 22 | 8.0 | 250 | 87 | 0.05 | 0.1 | 30 | 6.5 | 0.01 | 0.6 | 0.02 |
| Center | Ambarçayi | 50-70 | 24 | 8.0 | 375 | 80 | 0.04 | 0.2 | 25.7 | 5.7 | 0.02 | 0.8 | 0.02 |
| Hazro | Cesmebasi | | | | | | | | | | | | |
| Yazkoyu | source | 100-150 | 17 | 7.1 | 147 | 22 | 0.02 | 0.0 | 15 | 6.8 | 0.01 | 0.3 | 0.01 |
| Silvan | Basdegirmen | 30-50 | 18.1 | 7.3 | 170 | 27 | 0.02 | 0.0 | 15 | 6.4 | 0.01 | 0.6 | 0.01 |
| Basdegirmen | source | | | | | | | | | | | | |
| Silvan | Belbaki | 15-25 | 20 | 7.8 | 189 | 55 | 0.11 | 0.11 | 35 | 6.1 | 0.02 | 0.7 | 0.01 |
| Çatak köprü | source | | | | | | | | | | | | |
| Çermik | Seyhan | 100-150 | 19 | 8.2 | 381 | 83 | 0.04 | 0.1 | 25 | 5.9 | 0.02 | 0.7 | 0.02 |
| Center | stream | | | | | | | | | | | | |
| Çermik | Sinek | 50-70 | 24 | 8.1 | 170 | 15 | 0.03 | 0.2 | 10 | 5.2 | 0.02 | 0.5 | 0.01 |
| Center | stream | | | | | | | | | | | | |
| Çermik | Gözebasi | 30-50 | 17 | 7.3 | 155 | 20 | 0.04 | 0.1 | 15 | 7.2 | 0.03 | 0.4 | 0.01 |
| Center | source | | | | | | | | | | | | |
| Dicle | Büyükçesme | 250-300 | 10 | 7.3 | 110 | 20 | 0.02 | 0.0 | 0.0 | 8.2 | 0.0 | 0.2 | 0.01 |
| Degirmen | sources | | | | | | | | | | | | |
| Hani | Aynkebir | 50-75 | 15 | 7.3 | 110 | 81 | 0.02 | 0.0 | 0.0 | 7.7 | 0.02 | 0.2 | 0.01 |
| Aynkebir | sources | | | | | | | | | | | | |
| Hani | Seren | 35-50 | 17 | 7.2 | 110 | 120 | 0.01 | 0.0 | 7.0 | 7.4 | 0.0 | 0.2 | 0.01 |
| Seren | sources | | | | | | | | | | | | |
| Hani | Koki | 55-70 | 16 | 7.3 | 150 | 15 | 0.02 | 0.0 | 0.0 | 7.7 | 0.01 | 0.2 | 0.1 |
| Kirimli | sources | | | | | | | | | | | | |
| Hani | Balçakli | 50-75 | 20 | 8.1 | 210 | 44 | 0.02 | 0.1 | 15 | 6.1 | 0.0 | 0.4 | 0.1 |
| Yukari | stream | | | | | | | | | | | | |
| Turali | | | | | | | | | | | | | |
| Ergani | Bogaz | 35-50 | 18.1 | 7.9 | 215 | 100 | 0.02 | 0.1 | 25 | 6.5 | 0.02 | 0.5 | 0.1 |
| Yolköprü | stream | | | | | | | | | | | | |

heat, pH, conductivity, hardness, nitrite, nitrate, ammonia, iron, oxygen, carbondioxide and free chlorine concentration values) were examined. Turbidity, colour and smell were sensory evaluated; water heat was measured with a digital thermometre; pH, conductivity and oxygen was measured with a Hanna digital indicator and chemical measurements (hardness, nitrite, nitrate, ammonia, iron, free chlorine, carbondioxide) were done with a Hanna-C 200 field photometer and a DR-2010 field spectrophotometer by using water analysis criteria (APHA, 1985).

The physical and chemical values and water analyses data sheets of the water resources in the cities where this study was conducted are shown in Table 1-5.

## RESULTS AND DISCUSSION

It was determined that 13 out of 19 water sources in Adiyaman city were suitable for culture fish breeding according to the results of field surveys and technical examinations (Table 1). It was determined that 17 out of 19 water sources in Gaziantep city might be suitable for culture fish breeding and 3 of them might be risky because of the contamination by waste water from nearby residences and agricultural fields and the results are shown in Table 2.

It was determined that 2 out of 4 water sources in Kilis city might be suitable for culture fish breeding and the remaining 2 might be risky because of the contamination by waste water from both nearby residences and agricultural fields and because their flowrates in summer months drop drastically leading even to total drying-up (Table 3).

It was determined that 6 out of 11 water sources in Sanliurfa city might be suitable for culture fish breeding and the remaining 5 were not suitable since their flowrates were considerably low (Table 4).

It was determined that 13 out of 17 water sources in Diyarbakir city might be suitable for culture fish breeding and the remaining 4 might be risky because of the contamination by waste water from both nearby residences and agricultural fields and because their flowrates in summer months drop drastically leading even to total drying-up (Table 5).

## CONCLUSION

Direct results which were obtained as a result of the research we did at the water resources in the cities where the research was conducted and literature scan were provided since no studies had been done on these water resources.

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