In a series of experiments, the performance of three strains of Nile Tilapia, *Oreochromis niloticus*, was evaluated in 0.015 ha earthen ponds at Sagana Fish Farm. The strains were acquired from Lake Victoria, Lake Turkana, and Sagana fish farm. The first experiments were conducted from June 2002 to May 2003 and the other from October 2003 to April 2004. Nine ponds were limed at 3.3 tons/ha and treated weekly with urea and di-ammonium phosphate (DAP) at rates of 20 kg N/ha and 8 kg P/ha. The brood stock was conditioned in the ponds, and the F1 generation for each strain was produced. The experimental ponds were stocked with fry from the broodstock strains at 70,000 fry/ha, and raised from 0.5g to between 6-7g for a period of 66 days; their growth performance and survival were evaluated. The 6g frys were harvested and restocked at 50,000 fish/ha and further raised to 22g fingerlings. Later the 22g fingerlings were hand-sexed and the male *O. niloticus* post fingerlings from each strain were stocked at 20,000/ha. Their growth performance was then compared under two different feeding regimes. Relative ficundity was evaluated by counting fry from the bucal cavity of females from a broodstock that was placed in cages. Victoria strain had the highest growth performance, survival and relative fecundity while Turkana and Sagana strains had lower but similar performance. Sagana strain recorded the lowest survival and relative fecundity. The sex ration of the Sagana strain was highly skewed towards females while the wild strains had sex ratios close to 1:1. The results of the present study revealed that the Victoria strain was the fastest grower and survivor while the Sagana strain was an inbred strain.

**INTRODUCTION**

Development of aquaculture in sub-Saharan Africa is hampered by lack of good quality seeds (Leberg, 1990; Moreira et al. 2000). This scarcity is acute in rural areas where hatchery facilities are not available. The group of fishes known as tilapia (Cichlidae: Tilapiine) is endemic to Africa, Israel, and Jordan (Balarin & Hatton, 1979; Beveridge & McAndrew, 2000; Chimit, 1955 Philippart & Ruwet, 1982; Trewavas, 1983). However, in the last century, Tilapias have been introduced throughout the world mainly for food, a process that has led to deterioration of its quality (Teichert-Coddington & Smitherman, 1988). Poor fish management practices has also been reported to be the basis for the deterioration in the quality of *Oreochromis niloticus*. It is widely reported that inbreeding in fish results in significant depression in fish performance (Gjerde, 1988; Bondari and Dunham 1987; Galman et al., 1988; Leberg, 1990; Moreira, et al., 2000). This depression results from the loss of genetic diversity in poorly managed breeding programmes (Vrijenhoek, 1998), hence the growth rate, survival rate and reproduction activities are adversely affected. Some breeding programmes produce skewed sex ratios, which accelerate inbreeding (Vrijenhoek, 1998), and in such circumstances, fish fail to attain market sizes within a production cycle. The ability to reproduce and overpopulate culture facilities constitutes a salient feature of the
broodstocks were fed on wheat bran and allowed to
by empty ponds to prevent mixing of the strains. The
for each strain, with each block separated from others
three blocks with each block comprising three ponds
Before the start of the experiment, fish were stocked in
the Longech spit beaches. The weight of individual fish
seined from the Fugerson’s gulf of lake Turkana, close to
where they had been kept for a year. Turkana strain was
came from Kibos fish farm at the shores of lake Victoria
between 20.00 and 1.00 hours. Part of Victoria strain also
strain was obtained from Ndunga bay using cast nets
Sagana fish farm and used for the experiment. Victoria
origin of the fish was lake Turkana via Baobab Farm,
been used for research and production programs. The
farm for the last ten years. Over these years, this fish has
of Nile tilapia that has been cultured at the Sagana Fish
in this text will be used as a nominal name for a group
of O. niloticus strains from different localities within the
country. This study was designed to compare the growth and
reproductive performance of the locally available strains
of O. niloticus from different localities within the country.
This study was conducted at Sagana fish farm which is
located 2.6 km north west of Sagana town and 105 km to
the northwest of Nairobi. The farm is located at 1,231m
above mean sea level at coordinates 0°19’S and 37°12’E. Water was supplied to the farm by gravity from Ragati River through a 1.5 km long channel.
Three strains of the Nile tilapia, Oreochromis niloticus
were acquired from lake Victoria, lake Turkana and Sagana fish farm and used for the experiment. Victoria strain was obtained from Ndunga bay using cast nets between 20.00 and 1.00 hours. Part of Victoria strain also came from Kibos fish farm at the shores of lake Victoria where they had been kept for a year. Turkana strain was 
seined from the Fugerson’s gulf of lake Turkana, close to
the Longech spit beaches. The weight of individual fish
for the starting brood stock ranged from 50 to 200g for all the strains.

Before the start of the experiment, fish were stocked in
three blocks with each block comprising three ponds
for each strain, with each block separated from others
by empty ponds to prevent mixing of the strains. The
broodstocks were fed on wheat bran and allowed to
grow and reproduce in the ponds. After each spawning
the pairs of sexes in ponds was exchanged among ponds
within each strains. The resulting F1 fry of each strain
was graded using different size graders (plastic basket
with mesh (7mm x 10 mm) and wire mesh (5 mm x 5
mm)), and hapa nets (1 mm x 1 mm). The frys were
consequently, based on weight separated in to small
(0.5g), medium (1.0g) and large (1.5g). The small size
(0.5g) frys were used for the experiments because the
number of other sizes was not adequate in number to
start the experiment.

This study involved four experiments which were conducted
in two phases in 0.015ha ponds. In the first phase
which had two experiments, 0.5g fish fry were stocked at
a rate of 70,000/ha and raised to weights between 6 and
7g and their growth performance was monitored and
compared among the three strains. In the second experimen
t of phase one, the 6-7g fry were stocked at 50,000/
ha and raised to fingerlings (25-32g). In the first phase,
the experimental ponds received the normal fertilization
rates while fish were fed with wheat bran at 1.5% body
weight. The performance of the strains was evaluated
and compared among strains.

In the second phase, two experiments were conducted
based on two different feeding strategies.

In the first experiment of this phase hand-sexed fingerlings
were grown using organic manure and cassava leaves and their performances in terms of growth and
survival compared among strains. The fish were fed on
fresh cassava leaf meal at 10% body weight, but later
the feeding rate was adjusted upwards to 31% to cater
for the weight of leaf stalks that were not consumed
by the fish. The unconsumed leaf stalks were removed
from ponds at 8.00 hrs the following morning, prior to
the application of next batch of leaves at 10.00hrs. They
were weighed to determinethe actual amount of leaf
meal consumed by the fish. The ponds were also fertil
ized weekly with dry cow manure at the rate of 250 kg
per hectare. The second experiment in the second phase
phase involved raising the strains fingerlings in ponds
bred with inorganic fertilizaters of urea and DAP at
20kgN/ha and 8kgP/ha and supplemented with wheat
bran at 1.5% of body weight. All the experiments were
conducted in completely randomized design (Zar, 1996)
with three replicate ponds. The reproductive capacity
of the strains was evaluated and compared among strains
by holding males and females for each strain at a ratio of
1:2 in three replicate cages per strain.

Fish were sampled biweekly to monitor fish growth
and make adjustment for the daily feed ration. Fish in
each pond were seined, counted and batch weighed.
Data on lengths and weights were measured and used
to calculate length-weight relationship. Relative condi
tion factor (Kn) was calculated from adjusted mean
weights using covariance. Samples for water quality were obtained using a 1 m long column sampler Boyd & Tucker, 1992). Water samples were taken from three different points in the experimental ponds between 7.00 a.m and 8.00 a.m and and mixed in a bucket. From the mixed water sample, sub-samples were drawn for analyses of water quality variables. The water quality variables were analyzed biweekly and included alkalinity and other nutrients including NO₂⁻N, NO₃⁻N, PO₄³⁻N, total ammonia nitrogen (TAN) and chlorophyll a. The nutrients were analyzed as described in APHA (1989) while temperature and dissolved oxygen measurements were obtained by using YSI model 57 meters. pH was measured by glass electrode, Hi-9024 microcomputer. Chlorophyll a was determined by a method described by Boyd and Tucker (1992). A 25-cm Secchi disk was used to determine transparency.

The results were analyzed using Statigraphics Plus for windows (version 2.1, 1994-1996). One-way analysis of variance was applied to determine significant differences and multiple range test to determine which means were different from each other. Significant differences were declared at 0.05.

**RESULTS**

**First Phase**

Results of the first fry culture in fertilized ponds are shown in Table 1. There were no significant differences (P > 0.05) in mean fish weight and growth but significant differences (P < 0.05) were observed in percent survival of the fry among the three treatments. Victoria and Turkana strains had the highest survival while Sagana strain had significantly lower (P < 0.05) survival than Victoria and Turkana strains. Turkana strain had significantly higher (P < 0.05) condition factor than Victoria and Sagana but the latter pair had similar values (P > 0.05). All the strains maintained a steady weight increase with approximately linear growth (Figure 1).

Table 2 presents data on the water quality variables monitored during the first experiment. All the water quality variables which were monitored during the study period were not significantly different (P > 0.05) among treatments.

The water quality parameters are shown in Table 4.

**Grow-Out With Organic Matter and Cassava Leaves**

There were significant differences in mean weight of the fish among treatments (P < 0.05). The mean weights of the fish over the experimental period are depicted in Figure 2 Turkana strain had the least performance, while Sagana strain and Victoria strain had higher weight than the former. At 65 days post stocking, clear differences in weight gain emerged, with Victoria strain taking a clear lead. At the time of harvest, 128 days post stocking, Victoria strain led with a mean weight of 87.93 ± 2.70 g, which was significantly different. Sagana strain followed with a mean weight of 72.80 ± 2.70 g. Turkana was last with a mean weight of 67.60 ± 2.70 g which was significantly different from Victoria but similar to Sagana.

A total of 1218 fish of Sagana strain were hand-sexed, and after sexing, only 440 fish were males. This translated into female domination ratio of 2:1. From 1781 fish of Turkana strain sexed, at the end of the second experiment, 826 were males and 955 females, a sex ratio of near 1:1. Similarly for Victoria, a total of 1,675 fish gave 839 males and 836 females also with a 1:1 ratio.

Egg-brooding females were first observed in the Sagana strain 59 days or five months after stocking. In Victoria strain, eggs were observed 74 days after stocking, while in Turkana strain, brooding females were observed 89 days after stocking. The corresponding mean weights of females at first spawning were 22.6 g, 23.9 g and 23.2 g for Sagana, Victoria and Turkana strains respectively. There were significant differences (P < 0.05) in fecundity among strains. Victoria strain had the highest fecundity (4.6 ± 0.19) followed Turkana strain (2.8 ± 0.17) while Sagana had significantly the least fecundity (2.0 ± 0.3).

There were no significant differences in the condition factor among treatments (P > 0.05). Sagana strain had the highest condition factor of 2.87 ± 0.39 which is closer to 3, followed by L.Turkana strain with kn of 2.81 ± 0.08. L.Victoria was last with kn of 2.67 ± 0.08.

**Water Quality**

The results of inorganic fertilizer-wheat bran feeding regime are shown in Table 6. Victoria strain had significantly higher (P < 0.05) mean weight and growth rate. Sagana and Turkana had statistically similar mean weights (P > 0.05) but significantly lower than those for Victoria strain.

**DISCUSSION**

In the first experiment of phase, all the strains had similar growth performance. The ability of an individual to out compete the others becomes apparent when food and environmental factors become limiting. During the early stages of growth in the present study, it appears that fish fry had enough supply of natural food while the water quality was not limiting. Thus, differences in growth may not have been expected to occur. In the second experiment in phase one, the growth performance was significantly different among all strains with Turkana strain recording the lowest and Sagana the highest growth performance. However, the survival of the Sagana strain was low and therefore, the higher growth
in this strain may have occurred due to low density of fish in the ponds. In the first experiment of phase one, the growth performance was also significantly different among strains, with Turkana strain recording the lowest while Victoria and Sagana had the highest and similar growth performance. The results of this study demonstrate that Victoria strain is the most superior in terms of growth among all the strains studied. Significant differences in growth performance of the strains in this experiment demonstrates an environmental and genetic influence on the growth performance of the different strains.

Turkana strain, a wild strain recorded consistently lower growth performance compared to Sagana strain. This observation differs somewhat from the findings of Eknath et al. (1991), who observed better performance with the O. niloticus strains collected from the wild than the domesticated ones. Turkana and Sagana strains were originally residents of the lake Turkana. However, Turkana strain had a similar growth performance to Sagana strain, contrary to the above expectation. This may be attributed to the fact that while Sagana strain had been domesticated in ponds at Sagana Fish Farm for ten years, while Turkana strain was collected from the Ferguson Gulf and immediately used for this experiment. During this period, there are higher chances that the Sagana strain could have crossed with other locally available species of tilapia, which had improved its growth performance. Some fan tail banding characteristics of Oreochromis spilurus have been observed in Sagana strain. This observation suggests that Sagana strain is no longer the pure strain it used to be ten years ago. The effects of inbreeding in O. niloticus strain has also been reported. Hulata (2000), reported the failure of a local strain of O. niloticus in Vietnam to reach the minimum commercial size of 100 to 200 g within the normal growing season. The authors attributed this to high level of inbreeding which led to substantial decline in the yields and availability of quality tilapia stocks.

During the present study, a total of 1,218 fish of Sagana strain were hand-sexed, and after sexing, only 440 fish were males. This translated into a female domination ratio of 2.1. From the 1,781 fish of Turkana strain sexed, at the end of the second experiment, 826 were males and 955 females, a sex ratio of near 1:1. Similarly for Victoria, a total of 1,675 fish gave 839 males and 836 females also with a 1:1 ratio. This highly skewed sex ratio in the Sagana strain towards females could be attributed to a compensatory mechanism to counter the effects of routine hormonal application to obtain an all-male population. It is, therefore, likely that without sex reversal, the Sagana strain will produce more females than males. The unbalanced contribution of males and females to form the next generation enhances inbreeding (Moreira et al. 2000). It is apparent that, if this was allowed to go on for long, inbreeding would cut across many generations of O. niloticus in Sagana fish farm with unprecedented declines in fish yields.

During fecundity evaluation, egg-brooding females were first observed in the Sagana strain 59 days or five months after stocking. In Victoria strain, eggs were observed 74 days after stocking, while in Turkana strain, brooding females were observed 89 days after stocking. The corresponding mean weights of females at first spawning were 22.6 g, 23.9 g and 23.2 g for Sagana, Victoria and Turkana strains respectively. In natural waters (rivers, lagoons and lakes), Oreochromis niloticus maintains a steady growth over a span of two to three years (Kolding, 1993), achieving a total length of 50 cm and body weight of 7,000 g (Moreau et al. 1986; Pauly et al. 1988). Furthermore, this maximum size was reported to decrease with the decrease in the size of the watermass inhabited (De Silva, 1986; Duponchelle and Panfili, 1998).

Deterioration in the quality of Nile tilapia strains, in which a physiological switch from somatic growth to reproductive growth at a tender age, is a common phenomenon, but poorly understood phenomenon (McConnell, 1982; Little and Hulata, 2000; Lorenzen, 2000). At this small size of maturity, Nile tilapia reproduces every 3 to 6 weeks, a process in which energy is allocated to gamete production and spawning behaviour. Such high spawning frequency reduces the growth of fish, and it becomes a rarity for the fish to attain market size in a reasonable culture time. The early maturation for all the strains observed in the present study suggests that domestication in small fish ponds may have accelerated the rate of sexual maturity.

The growth performance of O. niloticus strain from lake Victoria in all the trials except in second experiment of phase I, was more superior than the other strains. However, higher growth rate of the Sagana strain in one of the experiments may be attributed to the lower survival rate in this treatment. The growth rates recorded in this study were lower than those observed by Khater & Smiterman (1988), in a study which evaluated three strains of O. niloticus. In that experiment, males from Egyptian strain grew at 1.63 g/day; Ivory Coast strain at 1.50 g/day and Ghana strain at 1.35 g/day. Elghobashy et al. (2000), evaluated the growth of four strains of O. niloticus under different farm conditions in Egypt and obtained higher growth rates than in the present study. The differences between the growth rates of the present study and those of the previous studies may be attributed to differences in hybridization and other environmental conditions. In rice fields, Elghobashy et al. (2000) observed growth rates that were comparable to those obtained in the current study. Although there was no supplementary feeding in the rice plots, fish grew fast, and this could be an attribute of a rich natural food resource including aquatic insects, snails and plankton populations which are prevalent in unnu-
dated rice fields and irrigation channels.

**Conclusions**

Victoria strain had the highest performance. L.Turkana and Sagana strain recorded similar mean harvest weight and the latter revealed a highly inbred strain.

**Anticipated Benefits**

It is envisaged that the research-based information generated by this study will recommend the best strain for higher yields with locally available inputs. This expected to stimulate interest in commercial tilapia production among the resource poor rural farmers in Kenya and the East African region at large. Also it is expected that adoption of the results will enhance income generation as well as house hold food security in the region. The aquaculture research and extension fraternity in biodiversity conservation will develop a protocol for the identification of strains of *O.niloticus* and other fish species for use.

**Acknowledgments**

The authors wish to thank Nancy Gitonga for giving this project an invaluabe support without which we would not have succeeded. This work was supported by Aquaculture CRSP.

**Literature Cited**


Table 1. Fry performance of the three strains of *O. niloticus* during the first phase (mean±SEM).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Turkana</td>
</tr>
<tr>
<td>Mean Weight (g)</td>
<td>6.5 ± 0.82a</td>
</tr>
<tr>
<td>Growth Rate (g/day)</td>
<td>0.1± 0.01a</td>
</tr>
<tr>
<td>Survival (%)</td>
<td>82.92 ± 2.81ab</td>
</tr>
<tr>
<td>Kn</td>
<td>3.70 ± 0.29a</td>
</tr>
</tbody>
</table>

Means with the same letters in a row are not significantly different. .SEM = Standard Error of Mean.

Table 2. Mean water quality variables in three treatments for experiment 1 phase 1 (±SEM).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Turkana</td>
</tr>
<tr>
<td>Total alkalinity</td>
<td>51.33± 7.38ab</td>
</tr>
<tr>
<td>Soluble reactive</td>
<td>0.15 ± 0.06a</td>
</tr>
<tr>
<td>phosphorus</td>
<td></td>
</tr>
<tr>
<td>Total nitrogen</td>
<td>0.60 ± 0.15a</td>
</tr>
<tr>
<td>NO₂-N</td>
<td>0.014 ± 0.01a</td>
</tr>
<tr>
<td>Chlorophyll-a</td>
<td>89.67 ± 18.16a</td>
</tr>
<tr>
<td>Temperature °C</td>
<td>22.02 ± 0.25a</td>
</tr>
<tr>
<td>Temperature °C</td>
<td>24.54 ± 0.59a</td>
</tr>
<tr>
<td>Dissolved oxygen</td>
<td>4.41 ± 0.84a</td>
</tr>
<tr>
<td>Dissolved oxygen</td>
<td>8.37 ± 1.32a</td>
</tr>
<tr>
<td>Secchi depth</td>
<td>29.10 ± 4.31a</td>
</tr>
<tr>
<td>pH</td>
<td>7.97 ± 0.36a</td>
</tr>
<tr>
<td>pH</td>
<td>8.82 ± 0.38a</td>
</tr>
</tbody>
</table>

Means with the same letter in a row are not significantly different, DO= dissolved oxygen, Temp.= Temperature.

Table 3. Fingerling harvest mean weight of *O. niloticus* strains.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Turkana</td>
</tr>
<tr>
<td>Harvesting mean weight (g)</td>
<td>22.85 ± 1.17a</td>
</tr>
<tr>
<td>Growth rate (g/day)</td>
<td>0.17 ± 0.01a</td>
</tr>
<tr>
<td>Survival (%)</td>
<td>84.0 ± 3.10b</td>
</tr>
<tr>
<td>Kn</td>
<td>2.00 ± 0.39a</td>
</tr>
</tbody>
</table>

Means with the same letter in a row are not significantly different. SEM is the Mean Standard Error.
Table 4. Mean Water quality parameters (±SEM) for the treatments.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Turkana</th>
<th>Victoria</th>
<th>Sagana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total alkalinity</td>
<td>43.37 ± 8.04ab</td>
<td>44.21 ± 8.04ab</td>
<td>47.98 ± 8.04a</td>
</tr>
<tr>
<td>SRP</td>
<td>0.01 ± 0.01a</td>
<td>0.0 ± 0.01a</td>
<td>0.00 ± 0.01a</td>
</tr>
<tr>
<td>TAN</td>
<td>0.09 ± 0.03a</td>
<td>0.09 ± 0.03a</td>
<td>0.60 ± 0.03a</td>
</tr>
<tr>
<td>NO₂-N</td>
<td>0.01 ± 0.004a</td>
<td>0.00 ± 0.004a</td>
<td>0.01 ± 0.004a</td>
</tr>
<tr>
<td>Chlorophyll a</td>
<td>62.33 ± 12.47a</td>
<td>50.56 ± 9.66a</td>
<td>63.9 ± 9.66a</td>
</tr>
<tr>
<td></td>
<td>40.13 ± 9.17a</td>
<td>38.62 ± 7.10a</td>
<td>50.44 ± 7.10a</td>
</tr>
<tr>
<td>Temp.°C_morning</td>
<td>23.85 ± 1.05a</td>
<td>23.81 ± 1.05a</td>
<td>23.67 ± 1.05a</td>
</tr>
<tr>
<td>Temp.°C_afternoon</td>
<td>27.30 ± 0.30a</td>
<td>28.45 ± 0.30b</td>
<td>28.10 ± 0.30ab</td>
</tr>
<tr>
<td>DO_morning</td>
<td>3.57 ± 0.68a</td>
<td>3.30 ± 0.68a</td>
<td>3.50 ± 0.68a</td>
</tr>
<tr>
<td>DO_afternoon</td>
<td>6.51 ± 0.83a</td>
<td>7.10 ± 0.83a</td>
<td>7.71 ± 0.83a</td>
</tr>
<tr>
<td>Secchi depth</td>
<td>26.50 ± 2.80a</td>
<td>24.87 ± 2.80a</td>
<td>19.23 ± 2.80a</td>
</tr>
<tr>
<td>pH_morning</td>
<td>7.77 ± 0.29a</td>
<td>7.63 ± 0.29a</td>
<td>7.88 ± 0.29a</td>
</tr>
<tr>
<td>pH_afternoon</td>
<td>8.09 ± 0.45a</td>
<td>8.21 ± 0.45a</td>
<td>8.51 ± 0.45a</td>
</tr>
</tbody>
</table>

Means with the same letters in a row are not significantly different. Dissolved oxygen, Temp.=Temperature.

Table 5. Results of fish growth on organic matter supplemented with cassava leaves regime.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Turkana</th>
<th>Victoria</th>
<th>Sagana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Weight (g)</td>
<td>67.6 ± 2.69a</td>
<td>87.9 ± 2.69b</td>
<td>72.8 ± 2.69a</td>
</tr>
<tr>
<td>Growth Rate (g/day)</td>
<td>0.28 ± 0.02a</td>
<td>0.44 ± 0.02b</td>
<td>0.33 ± 0.02a</td>
</tr>
<tr>
<td>Survival (%)</td>
<td>84.8 ± 3.89a</td>
<td>90.40 ± 3.89</td>
<td>87.33 ± 3.89a</td>
</tr>
<tr>
<td>Kn</td>
<td>2.81 ± 0.08a</td>
<td>2.67 ± 0.08a</td>
<td>2.87 ± 0.39a</td>
</tr>
</tbody>
</table>

Means with the same letters in a row are not significantly different. SEM is the Mean Standard Error.

Table 6. Results of fish growth on inorganic fertilizer supplemented with wheat bran.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Turkana</th>
<th>Victoria</th>
<th>Sagana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Weight (g)</td>
<td>141.2 ± 6.74a</td>
<td>184.5 ± 6.74b</td>
<td>150.1 ± 6.74a</td>
</tr>
<tr>
<td>Growth Rate (g/day)</td>
<td>0.8 ± 0.03a</td>
<td>1.0 ± 0.03b</td>
<td>0.8 ± 0.03a</td>
</tr>
<tr>
<td>Survival (%)</td>
<td>74.3 ± 3.53a</td>
<td>76.1 ± 3.53a</td>
<td>74.7 ± 3.53a</td>
</tr>
</tbody>
</table>
Figure 1. Growth curves of L.Turkana (TRT 1), L.Victoria (TRT 2) and Sagana (TRT3) strains.

![Growth curves of L.Turkana (TRT 1), L.Victoria (TRT 2) and Sagana (TRT3) strains.](image1)

Figure 2. Growth curves of Turkana (TRT 1), Victoria (TRT 2) and Sagana (TRT3) strains.

![Growth curves of Turkana (TRT 1), Victoria (TRT 2) and Sagana (TRT3) strains.](image2)
Figure 3. Growth curves for different strains on Nile tilapia *O. niloticus*.

Figure 4. Growth curves for different strains of Nile tilapia *Oreochromis niloticus*.