Fish are susceptible to various diseases. The major symptoms of disease of fish are loss of appetite, abnormal swimming movements, increase in the rate of ventilation, clumping of fins, remaining in the surface water, inactive in the bottom, production of excessive mucous and changes in colouration (Varghese, 1988).

Generally fishes have a good resistance power. The occurrence and magnitude of infections are closely related to the sanitary conditions prevalent in the water as also the condition and general health of the fishes themselves. (Jhingran, 1991)

In the present investigation, the diseases of the test fish are classified into two major groups from the causative point of view. (I) Parasitic infection caused by (a) Fungi, (b) Bacteria, (c) Protozoa, (d) Worms (e) Crustacea (II) Non-parasitic diseases caused by (a) Asphyxiation and (b) Miscellaneous reasons.

Ornamental fish farmers in temperate region have already practiced several treatments that are listed in the present study. However, this treatment is not effective and hence in the present study the treatment is modified to attain optimum effectiveness.

10.1. Zymosis types and traits

The nosology of common aquarium fish species so far reported by earlier workers along with those accounted in the present test fish species are depicted in Table 9.
FIGURE-15. ZYMOSIS TRAIT IN NANDUS NANDUS.

(Abbr. From left top clockwise: Myxosporidian cyst; Cyst becomes fatal haemorrhagic; Gill net induced fungal infection; Saprolegnia caused disease; Ulcer disease and Exopthalmia;
Table-9. Nosology of *Nandus nandus*

<table>
<thead>
<tr>
<th>Name of disease</th>
<th>Occurrence</th>
<th>% of occurrence of disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>I. PARASITIC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. PROTOZOAN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Myxosporidian</td>
<td>–</td>
<td>01</td>
</tr>
<tr>
<td>B. FUNGAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Body Fungus</td>
<td>17</td>
<td>28</td>
</tr>
<tr>
<td>ii) Eye Fungus</td>
<td>02</td>
<td>05</td>
</tr>
<tr>
<td>C. BACTERIAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Fin and Tail Rot</td>
<td>07</td>
<td>19</td>
</tr>
<tr>
<td>ii) Dropsy</td>
<td>–</td>
<td>01</td>
</tr>
<tr>
<td>iii) Exophthalmia</td>
<td>02</td>
<td>09</td>
</tr>
<tr>
<td>iv) Ulcer disease</td>
<td>06</td>
<td>11</td>
</tr>
<tr>
<td>D. HELMINTH INFECTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) <em>Camallanus</em> (Nematode)</td>
<td>03</td>
<td>07</td>
</tr>
<tr>
<td>ii) Cestode</td>
<td>01</td>
<td>03</td>
</tr>
</tbody>
</table>

A. Protozoan infection

*Myxosporidian*

The causative myxosporidian genera reported are mainly *Leptotheca, Chloromyxum, Myxobolus, Hennegunya, Myxidium, Thelohanellus* and *Leptospera.*
Symptom: The parasite produces cysts on different regions of the body especially in the opercular region, dorsal part of the body and caudal region. Heavy infection can lead to bursting of the cysts and ulceration, raising of the scales along the posterior margins and falling of scales as elucidated in Figure 15.

Stage of infection: Infection found in adults.

Treatment: Chloromycetin 125 mg dissolved in 300 ml of water and spread over the aquarium. Second dose of 125 mg chloromycetin in 300 ml of water is administered after 4 days. After 7 days of initial infection, small cysts are observed at the places of initial infection. A mixture of 250 mg Tetracycline, 250 mg chloromycetin, 2 mg K MnO₄, 2 mg Riboflavin and 2 mg malachite green is prepared. Initially a bath in 3 ml/l of the above mixture for ½ hr is given daily until the disappearance of all the cysts. The cysts re-occur after a lapse of 15 days. Bath in 0.5 mg NaCl / litre of water is given daily in the morning and a bath in 2 mg/litre malachite green for 15 mins, is administered daily after 5 hours of first bath, until the cysts disappear. For mild infection, dip treatment in 0.5 mg NaCl / litre water daily twice for 15 mins is effective.

Period and duration: The duration of the disease is 7 – 30 days.

B. Fungal infection

Body Fungus The causative fungus for this disease as reported by earlier worker is Saprolegnia spp.

Symptom: Tufts of minute white hair like outgrowths occur in the affected area of the body as in figure 15.

Stages of infection: Infection is found in both adult and sub-adult fish.

Treatment: In case of mild infection in fin rays, manual removal of the fungal hyphae with forcep and dipping the infected fish in 1 mg/ liter KMnO₄ for 5 mins is effective. Chloromycetin 125 mg dissolved in 300 ml water is spread over the hospital
tank is found effective. In case of heavy infection a second dose of 125 mg chloromycetin dissolved in 300 ml of water is administrated and is found effective.  

**Duration of treatment:** 2 days in case of mild infection, 7 – 12 days in case of heavy infection.

**Remark:** The disease mostly occurs in the dorsal portion of the body, beneath the dorsal fin and also in the opercular region. In case of severe infection, it may pierce the opercular bone and expose the gills.

### C. Bacterial infection

**Tail and fin rot:** The causative bacteria for this disease as reported by earlier worker are mainly *Aeromonas spp*, *Pseudomonas spp* and *Vibrio spp*.

**Symptom:** The first signs of the disease is the appearance of a white line on the margin of the fin, spreading and imparting frayed appearance to the appendage which eventually petrifies and disintegrates.

**Stage of infection:** Infection is found mainly in adult as well as sub-adult stages.

**Treatment:** Dip treatment in 1–2 mg malachite green/litre of water is found effective

**Period and duration:** 7–10 days treatment is necessary depending on the intensity of infection.

**Dropsy**

**Symptoms:** Accumulation of fluid inside the body cavity, and scale protrusion

**Stage of infection:** Infection is found in sub-adults.

**Treatment:** Chloromycetin at a concentration of 125 mg in 5 litre water is effective.

**Period and duration:** 3–10 days treatment is necessary.

**Exophthalmia**

The causative organism of this disease is the bacterium *Aeromonas liquifaciens*
Symptom: The infected site is eyes. During initial stages cornea of the eye becomes vascularized and later becomes opaque, subsequently the eye ball gets petrified, leading to death. The manifestation has been depicted in figure 15.

Treatment: Dip treatment in 8 -10 mg/l tetracycline for 1 hr given for 2 -3 days is effective.

Period and duration: The period of the disease is 3-15 days.

Ulcer disease
The causative bacteria for this disease reported by earlier workers are Flexibacter columnaris.

Symptoms: The symptoms of this disease is occurrence of raised, white plagues, often with reddish peripheral zone leading to hemorrhagic ulcers as depicted in figure 15.

Stage of infection: Infection is found in adult stage.

Treatment: Chloromycetin 125 mg dissolved in 300 ml water is spread over the hospital tank is found effective. If no improvement is noticed a second dose of 125 mg Chloromycetin is administered and found effective with 50% change of water. Bath treatment in 1 mg KMnO₄/litre along with 250 mg Chloromycetin dissolved in 1 litre water is found effective.

Period and duration: Duration of the diseases is 7 -12 days.

D. Helminth infection
The helminth infection is found negligible in the studied fish mostly caused by nematodes (Camallanus). The infection is comparatively more in female (6.52%) than male (2.70%).

10.2. Prophylactic and control measures

It is possible to control fish disease by prophylaxis (preventive treatment), therapy (curing treatment) and metaphylaxis (after cure). It is well known
that prevention is better than cure. This also applies in the case of fish. With the observance of this principle most of the losses can be avoided from the very outset, particularly when disease are often, difficult to cure or cannot be cured at all once they break out.

Preventive measures and practices should be economical and should cover as far as possible all fish disease. The origin of many fish disease may be due to on one hand, deficiencies in the environment and the maintenance and on the other hand, to the general condition attained by fish and to inherited and acquired resistance.

The general prophylactic measure adopted in the present experiment for the prevention of disease of test fishes is.

(i) Avoid of over crowding: This is not an actual cause of disease but contributes to the rapid spread of any infection.

(ii) Avoid of over feeding: Over feeding contributes to diseases sometimes because uneaten food on the bottom of the tank will rot and pollute the water.

(3) Avoid supply of inadequate diet: The supply of inadequate feed especially poor quality dried food is one of the factor of gross imbalance in protein–carbohydrate fat ratio, which leads to a variety of infection.

(4) Partial water change in a week: Approximately 10-12 % of the water in a tank should be changed weekly under ideal condition. This prevents the building up of excess nitrogenous condition and will help keep the entire tank in good condition.

(5) Maintenance of water quality: Rapid changes of the physico-chemical properties of the aquarium water will have weakening effect on fish. The water quality like dissolve oxygen, water temperature, pH value and hardness are maintained in permissible limit for prevention of disease.
(6) **Precaution on new addition:** The unfortunate experience of introducing new fish, plants, small or accessories into the established aquaria have caused a sudden onslaught of disease. Therefore, precautionary measures are taken before introduction of new addition.

(7) **Quarantine process:** The precautionary measures for preventing disease in the quarantine process. All new addition is kept in the quarantine aquarium for 2 – 4 weeks.

(8) **Avoid contamination:** The contamination takes place due to unsterilized net and unwashed hand. Therefore, proper sterilization method is followed after handling of diseased fish and tank.

(9) **Proper cleanliness and filtration:** The lack of cleanliness and filtration leads the aquaria unhealthy, which may help for disease. The utmost care is taken for cleanliness and filtration of the aquaria.