6. BREEDING MANAGEMENT OF EMU

1. EMU HATCHERY MANAGEMENT

Efficient production of viable healthy emu chicks is vital to the emu industry. The detailed knowledge of incubation of emu eggs and emu hatchery management is a must for emu farmers.

Methods of incubation

Two types of incubation can be used: (i) Natural (ii) Artificial. Most of the emu farmers uses artificial incubation.

Natural Incubation

In natural incubation, the male emus go broody and are allowed to sit on the eggs, when young females begin to lay. Eggs are commonly laid at random throughout the pen. After a time or after the onset of maturity, a nest site will be chosen and eggs are then laid at this site. Dispersed eggs rolled together and often camouflaged with dry grass, sticks and leaves, etc by the male emu. After some 6-10 eggs have been laid, the mature male will go broody and begin sitting on the eggs. Further eggs laid near him are rolled under to join the others. Over a few days, the male will slow his metabolic rate to a point where he sits on full time, will not eat or drink and only stands several times a day to roll the eggs. The incubation period for emu egg is 52 days but it is a good policy to check daily from day 50 to see if any chicks have hatched. There are many problems associated with natural incubation including the potential for bacterial contamination of eggs, especially in wet conditions. Some eggs will be in the pen for two to four weeks before the male sits. During this time, daily temperature fluctuations may trigger the embryo to begin developing and the low night temperature may kill the embryo.

Artificial incubation

In artificial incubation, eggs are incubated in a egg incubator. Cabinet type incubator is most commonly used to incubate the emu eggs. There are of three types of incubators. The combined setter and hatcher, separate hatcher and the small table machines with air circulation assisted by a fan. Based on the egg setting, the incubator also classified into two types (i) Single stage incubator (ii) Multistage incubator. In single stage incubator all emu eggs set at the same time and all the embryos are at one age. In multi stage incubator, eggs set at different times and embryo of various ages.

Collection of emu eggs

Trained workers should watch breeding hens, so that eggs are collected 10 to 15 minutes after laying. Quick collection prevents damage of the embryo in hot temperatures, microbial spoilage and less from theft or predation. The eggs should be gathered carefully and wiped with dry cloth. Holding the eggs with sterile toweling
helps to prevent possible contamination from workers hand. The eggs are then placed in a carrying basket lined with foam rubber or cotton to prevent breakage. The collected eggs should be kept dry and as clean as possible. Any egg that happens to have a large accumulation of soil or faecal materials should not be set in the incubator. Egg can be stored in a cooler condition prior to incubation, provided that cooler is regulated to 56 to 60°F and 75% humidity to prevent desiccation of the eggs.

Emu hatchery

The location of emu hatchery should be as far as away from the other pens as possible to avoid dust and other particulates from being pulled in to the hatchery. The hatchery room is much more than a shelter for incubator. The room acts as a 'Plenum' chamber that helps pre condition air prior to movement of the air into the incubator. A most incubator depends on proper room temperature and humidity to make the work of maintaining incubator conditions easier. Typically the temperature of the hatchery room will be approximately 10 – 15°F cooler than the temperature of the incubation cabinet. The temperature difference is needed for cooling the eggs as the embryo develops, and to ensure proper heating of the cabinet early in the incubation period. The quality of the air is an important matter for consideration as well. Air filters used be monitored and changed frequently to maintain good air quality. The hatchery needs to be designed for one way traffic of personnel and eggs to reduce the possibility of contamination. Both air flow and personnel traffic should move from the incubator end and exit at the hatcher end. All surfaces within the hatchery should be washable with cleaners and disinfectants commonly available.

Temperature

Temperature is the most critical factor in incubation. It affects both quality and quantity of hatch. A 0.5°F change in incubator temperature can have a profound effect in overall performance of incubation. Optimum temperatures vary with individual incubators, manufactures and model, geographical and within building location, number of eggs in the incubator and many other factors. A common incubation temperature for emus ranges from 96.7 to 97.7°F for multistage incubators. Incubators without fan are normally run about 2°F higher than those with fans. The hatcher temperature should approximately 1°F lower than that of setter because of the large amount of heat generated by the late stage embryos. Eggs that are hatching early or very small chicks at hatch are an indication of incubator temperatures being too high. Eggs that take two or more days to hatch a live chick could be associated with too low of an incubator temperature.

Humidity

For an embryo to develop properly and to transform in to a chick of normal size, the egg contents must be evaporating at an established rate. High humidity reduces egg evaporation, while low humidity increases it. Adjustments normally are needed to obtain the desired egg weight loss. Most emu eggs perform well when a moisture loss
of 12 – 16% is achieved. An approximate relative humidity requirement for emu egg incubator is 52%. Insufficient water loss results in large, sluggish, edematous chicks which are often in a malposition in the egg causing problems in piping the shell and in hatching. Excessive water losses are resulting in small, dehydrated, weak chicks that may not be strong enough to hatch. When eggs are transferred to the hatcher, the humidity should remain the same as in the incubator, until the embryos begin to pipe the shells. At that time the humidity should be increased to prevent membranes from drying too quickly which causes the embryo to stick on to the shell. Humidity during hatching process should be approximately 60% in the emu.

**The temperature and humidity for incubating the emu eggs**

<table>
<thead>
<tr>
<th>Details</th>
<th>Temperature</th>
<th>Humidity</th>
<th>No. of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setter</td>
<td>97.5°F</td>
<td>84°F (as wet bulb)</td>
<td>First 49 days after setting</td>
</tr>
<tr>
<td>Hatcher</td>
<td>96.5°F</td>
<td>86°F (as wet bulb)</td>
<td>50 – 52 days</td>
</tr>
</tbody>
</table>

**Emu egg positioning and turning**

Egg positioning in the incubator and turning will ensure that the embryo is fully developed and in position to hatch. Emu eggs and other opaque shelled eggs should be placed on their sides. Studies have shown that 1 to 2 % increase in hatchability over that of eggs placed on their sides.

Egg turning during incubation involves turning frequency, axis of setting, axis of rotation, turning angle, plane of rotation and stage of embryonic development requiring turning. The absence of egg turning has been shown to result in adhesion of the embryo to the inner shell membrane, premature or abnormal adhesion of the embryonic membranes to the inner shell membrane or other structures, increased incidence of malpositions, decreased albumen utilization, abnormal fluid distribution in the egg, decreased oxygen exchange surface of the chorioallantoic and a poorly developed yolk sac. The number of turns by automatic incubators is typically 12 or 24 turns in any given 24 hours period. Eggs set at air cell end up hatch best when turned 90° to rest at 45° angle, where as those set horizontally hatch best when turned approximately to 180°C.

**Ventilation**

Ventilation within the incubator and hatcher provides adequate oxygen supply, removes excess carbon dioxide and is a factor in maintaining proper humidity level. Ventilation recommendation may vary considerably from one type or model of incubator to another. Recommended incubator levels are 21% oxygen and 0.05% to 0.1% carbon dioxide for emu egg incubation.

**Hatch waste breakout**

After the hatching process, surveying the hatch waste is very important. Look for signs of stress by noting how much fecal material is left on the hatcher tray. A large
amount of material signifies that the chick may have been in the hatcher longer than necessary. Break open all unhatched eggs that may have been pulled during the incubation period, or eggs that failed to hatch that were left in the hatcher.

After opening the eggs, note the color, odor and appearance of the albumen yolk and membranes within the egg. Note the size and position of the embryo (if found) within the egg. Small sized chicks with little feather covering denote early embryonic death. Larger sized chicks covered well with feathers denote late embryonic deaths.

Common symptoms found in breakout

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Check for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smelly, brown colored albumen</td>
<td>Contamination of eggs</td>
</tr>
<tr>
<td>Missing or small lower jaws</td>
<td>High / Low Selenium, Low Calcium</td>
</tr>
<tr>
<td>Chicks with head away from air cell</td>
<td>Proper positioning in incubator tray</td>
</tr>
<tr>
<td>Extremely small embryo or chick, no feathering seen (early death)</td>
<td>High incubator temperatures during beginning period of incubation</td>
</tr>
<tr>
<td>Low water loss within eggs, Edema seen in chicks</td>
<td>High humidity in incubator, Vitamin E / Calcium / Selenium deficiencies</td>
</tr>
<tr>
<td>Chicks with dry membranes stretched and surrounding chick</td>
<td>Low humidity in incubator and possibly within the hatching cabinet</td>
</tr>
<tr>
<td>Chicks hatched with large amounts of yolk exposed</td>
<td>Late high temperatures in incubator &amp; hatcher, low water loss during incubation</td>
</tr>
<tr>
<td>No embryo seen within egg, undeveloped germinal disk</td>
<td>Infertility, lack of breeding activity</td>
</tr>
</tbody>
</table>

Reproductive performances determination

Fertility is normally measured by the number of clear eggs pulled from an incubator cabinet, after a normal duration of incubation. True fertility is expressed as those eggs that were exhibiting signs of fertility whether or not they developed embryos. This would involve infertile eggs that did not start development and eggs that failed to hatch with a visible embryo contained in the eggs. The total egg hatchability, fertile egg hatchability and fertility were calculated using the below formulae.

\[
\text{Total egg hatchability} = \frac{\text{Emu chicks hatched}}{\text{Total eggs set}} \times 100
\]
Fertile egg hatchability = \frac{\text{Emu chicks hatched}}{\text{Fertile eggs set}} \times 100

Fertility = \frac{\text{Total eggs set} - \text{Infertile eggs}}{\text{Total eggs set}} \times 100

Hatchery hygiene

The hatchery should be regarded as a potential source from where disease can spread. A sanitary hatchery is necessary to produce high hatchability and good quality chicks. The floor of hatchery incubator cabinets and instrument must be washed with disinfectants like cresols, phenols, iodine, chlorine, quaternary ammonium etc. Disinfection should be done before and after hatching operations. Fumigation of eggs and incubators is an essential part of hatchery sanitation program. It should be done properly because improper fumigation is rather hazardous. Routine pre incubation fumigation of emu eggs is not usually recommended. However, each egg entering the hatchery should have been subjected to pre incubation fumigation. Potassium permanganate (KmNO₄) method of fumigation is most commonly practiced. Before fumigation it is necessary to know the cubic space inside the incubator, which is obtained by multiplying the height, width and depth of incubator.

Formaldehyde is commercially available as 40% solution in water known as formalin and as a powder containing 91% formaldehyde. When either product is heated, formaldehyde gas is produced. It is quite toxic with a tolerance level of 5 ppm in air, and hence inhalation should be avoided. To fumigate incubators, frequent recommendations specify 60gm KmNO₄ and 120 ml formalin per 100 cubic feet cabinet space, 21 °C with 70% humidity for 20 minutes. However, the ratio of KmNO₄ to formalin requires for optimal generation of formaldehyde is two parts of KmNO₄ and three parts of formalin. Use an enameware or earthen vessel of large capacity and deep enough which will avoid bubbling and splattering action when the two are mixed. Place the vessel and KmNO₄ to the area to be fumigated, then add the formalin and never vice versa. Higher temperature and humidity are the most effective way of fumigation. In some instances it is necessary to stop the action of formaldehyde gas after its required period of fumigation. This may be accomplished by opening the air intake and exhaust in the incubators. The process is too slow. Ammonium hydroxide may be used to expedite the process, for which a solution of 26-29% ammonia should be sprinkled into the incubator cabinet depending on the amount of formalin used.
2. EMU CHICK MANAGEMENT

Emu chicks weigh about 370 to 450 g (about 67% of egg weight) depending on the size of egg. The chicks hatched out retained in the hatcher for first 3 days. First 48-72 hours, emu chicks are restricted to incubator for quick absorption of the yolk and proper drying. The brooding shed would be prepared well in advance with thorough cleaning and disinfection and flooring should be covered with gunny bags to prevent slipping of legs of young chicks. Emu chicks have long legs and are very active, slippery flooring will make emu chicks to have hip dislocation resulting in irreparable damage. Arrange a set of brooder for about 25 to 40 chicks giving four sq.ft per chick for first three weeks. Provide brooding temperature of 90°F for the first ten days and 85°F till three to four weeks. Provide feed and water with a brooder guard of 2.5 ft height. Provide sufficient (5) water mugs of a liter capacity and equal number of feeder troughs under the brooder. A chick guard must be 2.5 ft height to avoid jumping and straying of chicks. Provide 24 hours of one foot candle light i.e. 40 watt bulb for every 100 sq ft area. After 3 weeks of age, slowly extend the brooder area by widening the chick guard circle and later remove it by the time chicks attain 6 weeks. Feed starter mash for first 8 weeks or till attaining standard body weight of 10 kg. Ensure proper floor space for the birds housed as these birds require run space for their healthy life. 30 ft run space is required; hence floor space of 40 ft x 20 ft is required for about 40 chicks if out door space is provided. Floor must be easily drained and free from dampness. Periodical body weights on 10% of birds will give a scope for correction of management defects. Never make over crowd in the pen, first few days provide sanitized water and anti-stress agents.

Application of leg band

Immediately after the release of chick the naval region is cleaned with antiseptic solutions like povidone iodine. To avoid splayed leg problem immediately after hatching the legs were properly secured by applying leg band. The leg bands in chick is removed after 3 days and introduced in to the brooder house.

Emu chicks brooding

Like chicken, emu needs brooding during their early life that includes proper heat, water, food, ventilation, light and litter.

1. Heat: Heat is important that chicks are brooded at the correct temperature in a draught-free suitable sized area. The best guide to the correct temperature is the chicks’ thermal comfort behaviour. If they huddle close to the heat source they are cold. If they are well dispersed, they could be too hot. A maximum-minimum thermometer put near the chicks will provide valuable information on temperature fluctuations (particularly during the colder parts of the night) to assist your management. As the chicks grow older, the temperature can be reduced. The following table provides a guide to the temperatures required by ratite chicks at different ages during brooding.
<table>
<thead>
<tr>
<th>Age (days)</th>
<th>Temperature at chick level (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7</td>
<td>30+</td>
</tr>
<tr>
<td>7-14</td>
<td>28</td>
</tr>
<tr>
<td>14-21</td>
<td>26</td>
</tr>
<tr>
<td>21-28</td>
<td>24</td>
</tr>
</tbody>
</table>

2. Water: Death of young chicks is often due to their failure to find water. For such deaths to be prevented, young chicks must learn very early in life where to find water. Cool, clean water must be available to them at all times in several small, readily accessible drinkers. Their attention can be attracted to the water by shiny or coloured objects placed in the water containers - making sure that the chicks cannot eat the objects.

3. Feed: In the first 2-3 days of life, chicks may eat very little. However, feed should be made available to them so that they learn to peck and eat. Emu chicks need a fresh, high-quality starter diet containing about 21% protein. This can either be as a mash or as a crumble. In addition, daily access to small amounts of fresh, finely-cut green material like lucerne, kikuyu or broad leafed grasses sprinkled on the feed to help encourage the chicks to eat is recommended. Both emu and ostrich are attracted to the colour green.

4. Ventilation: Chicks need a constant supply of fresh clean air if they are to grow well and remain healthy. Chicks quickly chill therefore draughts should be prevented at all cost. With localised brooding draughts can be blocked out by using solid panel surrounds (at least 300-450 mm high). To increase the space available, the surround is gradually expanded as the chicks grow thus enabling chicks to get away from the heat.

5. Light: The best lighting regime is yet to be developed. However emu chicks do respond and grow better when a constant light source is provided. This enables the chicks to move around the pen to find feed and water throughout an extended period. A program of 23 hours of light at an intensity of 20 lux has provided excellent growth rates while intensities equivalent to a 40W bulb have also been found satisfactory. It is essential that the chicks do have a period of darkness; this prevents young birds huddling together which may result in suffocation if a blackout should occur.

6. Litter: A lot of information has been written about litters, most problems which occur during brooding are a direct result of management decisions and not the particular litter, although some litters do have advantages over others. It is essential to use a litter which satisfies the young chick’s needs and therefore you should choose a litter which is clean, chemically free, soft, absorbent has good insulation properties and is relatively dust free. Litters which satisfy these requirements are pine shavings, sand and sawdust.
Do's:
- Never over crowd the pen
- For the first few days, provide sanitized water and anti-stress agents
- Clean the waters daily, otherwise automatic waters are preferable
- Monitor the birds daily for their comfort, feed intake, water intake, litter condition etc for making immediate corrections if any.
- Ensure proper mineral and vitamins in the feed for healthy growth of chicks and to avoid leg deformities.
- Practice all- in -all -out rearing to maintain better bio security

Don'ts:
- Never handle the birds during hot hours.
- Birds easily excite. Hence, calm and quite environment in the pen is required
- Birds easily grab any item, so avoid certain objects like nails, pebbles etc in the vicinity of birds
- Avoid unauthorized persons, material into the farm. Proper biosecurity must be ensured
- Never keep the birds on smooth and paddy husk spread surface, as the young chicks easily excite, run and break their legs due to slipperiness.

Health management of emu chicks

Most emu chick health issues can be prevented through healthy prenatal nutrition or chick nutrition.

Before the hatch of emu chick

Assisted hatching

At times during the incubation season, producers feel the need to assist eggs that are not progressing in hatch. Care must be taken when assisting a hatch to prevent problems arising from the assistance procedure. Typically in emu, a period of 12-18 hours should be allowed from the time, the bird breaks, through the internal shell membrane, into the air cell, until it breaks a hole in the egg shell before hatching assistance is offered. If the chick fails to break the shell after twelve hours duration, a series of 3/8" holes could be drilled into the upper and lower edges of the air cell of the egg to allow enough oxygen to flow to the chick. Wait a few hours, and notice the condition of the membranes within the egg. The membrane should be somewhat dried and will bleed very little if torn, before assistance can continue. Slowly break larger holes in the egg, starting with the two holes from the air cell end of the egg. Always be
sure to check on the condition of the chick and check (if possible) the location of the yolk sac. If a small part of the yolk sac is visible, you may wish to leave the chick in the egg for a period of time to allow for the navel to close fully.

Timing is critical to the operation and assistance of hatch should not continue for more than 1 ½ days in length. Prolonged assistance usually results in weak chicks that may not be able to stand and eat. Further delays could lead to death. There is no guarantee that an assisted chick will survive, and historically assisted chicks have not performed as well as un-assisted chicks.

After the hatch of emu chick

1. Star gazers, head retraction/weaving

The head retracts back until the beak is pointed upwards or over it’s back. There may be head tremors. Sometimes the chick chirps excessively. This theory is that high weight loss dehydrated the egg and that nutrients have not been absorbed properly. Prevention: Give electrolytes in the water, expose to sunlight. Treatment is Vitamin B complex shots.

2. Leg problems

- **Splayed legs:** The affected leg twists out away from the body, rotating to point the toes to a right angle from the body. Splayed legs appear to be caused by two different things, injury and nutritional deficiencies.

- **Deformed legs:** bowed or twisted bones, one leg shorter than the other, etc. This is caused by a deficiency in the B vitamins and if caught early can be treated by changing to a better diet. Some deformity may remain, but the chick can at least be raised to processing weight.

- **Injury:** Crowded pens, slick floor surfaces, getting caught behind watering dishes or feeders. Prevention - lots of room, putting a towel down on the hatcher floor, straw or another material on the chick floors, eliminating ‘danger areas’ in the pens.

- **Nutritional deficiencies in chicks:** Emu chicks need a balanced ration in order to develop strong tendons, bones and muscles.

3. EMU GROWER MANAGEMENT

As Emu chicks grow, they require a bigger size of waters and feeders and increased floor space. Identify sexes and rear them separately. Provide clean water all the time and offer feed as much as they want. Ensure dry litter condition through out the grower stage. Provide 40 ft x 100 ft space for 40 birds if out door space is considered. Floor must be easily drained and avoid dampness. Feed the birds on grower mash till birds attain 34 weeks age or 25 kg body weight. Offer greens about 10% of diet particularly different kinds of leaf meals for making the birds adopt to fibrous diets. Growing emu need to be fattened to improve body weight (40kg) and FCR (5:1) at the
time of marketing for table purpose. Offer finisher ration from 35 weeks age to slaughter or up to 12-18 months age. Bird yield 53% dressed meat and 3-4 liters of fat. Inclusion of vegetable fat at 3-5% in emu diet will fetch better FCR and net returns since the birds at this age utilizes fat in an efficient way compared to the chicks of young age of less than 15 weeks. The sub-adults kept for breeding purpose need to be fed on maintenance feed specifically made for this purpose from 35 th week age to sexual maturity by 18-24 months.

Do's:

- Monitor flock at least once daily for alertness of birds, feeding and watering troughs.
- Notice leg deformities, droppings. Identify and isolate ailing birds
- Practice all-in -all-out system. Never keep in the vicinity of the adult birds.

Don’ts:

- Never keep the sharp objects, pebbles in the vicinity of the birds. Birds are mischievous and grab any thing that comes in their vicinity.
- Never handle or disturb the birds for restraining or vaccination during the hot weather conditions.
- Provide cool and clean water through out the day.

4. EMU BREEDER MANAGEMENT

Phenotypically emus look similar in both sexes. However, sexing is done on day old based on feather sexing, vent sexing by identify male organ and sound differentiation on maturity. Male emu after maturity makes grunting sound and female makes drumming sound. Identification of emus is done usually by painting different colours on the legs, leg strips and micro chipping.

Sex differentiation

1. Vent sexing: Sex determination in birds can be performed by examination of cloaca for the presence of phallus or clitoris by direct examination or using proctoscopy.
   - Phallus (sexual organ) clearly visible in male chick.
   - Sexual organ of 8 month old male - showing slight corkscrew twist.
   - Sex organ of yearling female – small protuberance.

2. Surgical sexing: Surgical sexing performed by using laparoscope. Surgical sexing of emu by laparoscopy necessitated anaesthesia and the risk of accidental injury to the vital organs that may be harmful and even lethal to the emu birds.
3. Steroid sexing: Faeces of female birds have higher immuno reactive estrogen / testosterone ratios than males.

4. DNA based sexing also used differentiates emu sex with help of blood or feather.

Emu breeding behaviour

Sexual maturity is reached after 2 to 3 years but breeding in captivity can occur as young as 20 months. Well-nourished emu hens begin laying at approximately 2 years of age and are reported to have a productive life of approximately 16 years. They are monogamous indicating one male for one female. Male and female emus pair up in October to March. The female dominates the male during pair formation. Once the pair is formed, it may last for about five months with a mating at every 3-4 days which includes courtship, nest building and egg laying. During the courtship, both genders start strutting and circling; ruffling out their feathers and cocking their heads in a shy posture. The male starts a mating dance with slow, snake-like back-and-forth movements of his head while circling around the female. The male needs a lot of patient persuasion to get a conquest, otherwise, the female can turn very aggressive. Naturally mated female emus store spermatozoa in the tubules of the oviduct and release them over a period of time, termed the "fertile period", during which a maximum of 6 eggs can be fertilized. Volume of ejaculate in Emu is ranging from 0.4 to 1.2 ml and each ejaculate contains about 1.2-3.5 x 10^8 spermatozoa.

Emu breeding

Emus are short day breeders. In the past it has been speculated that the cold weather brings on breeding season, but scientific research in Australia reveals it is the length of the day that is important. The photoperiod (amount of daylight) apparently affects the production of the reproductive hormones. As the days shorten, there are increases in the plasma concentrations of luteinizing hormone and testosterone in the male emu. After roughly 115 days of 10-hour (or less) days, there is an increase in prolactin concentrations. As the prolactin concentrations continue to increase, the Luteinizing and testosterone will decrease until eventually the male stops breeding. During this period of time the female’s hormones begin to stimulate egg production and make her receptive to the male’s advances.

Emu breeding management in captivity

In commercial farming emus are paired in separate enclosures after maturity depending on the compatibility of the pair. During mating, offer floor space about 2500 sq.ft (100x25) per pair. A few trees or shrubs in the pens will provide privacy and help induce mating. Offer breeder diet well in advance i.e 3- 4 weeks prior to breeding programme, and fortify with minerals & vitamins to ensure better fertility and hatchability in birds. Semen collection and artificial insemination was successful in emu so that the cost of male maintenance could be minimized. Its implementation needs skill. Soon
after breeding season, separate the sexes and house them in flock and feed on maintenance ration. Normally adult bird consumes 1 kg feed/day but during breeding season feed intake will be drastically reduced hence intake of nutrients must be ensured.

Reproductively active cocks can be extremely protective and aggressive. Caution should be taken when entering their breeding areas. Growers hens and cocks should be reared separately from 1 year of age to sexual maturity. Mature hens and cocks should be separated after the breeding season. This will allow the birds to be more rested, and they will begin egg production more readily when placed together for the breeding season in September. When pairing hens and cocks, always present the cock to the hen in her pen. Sometimes pairs are incompatible and do not mate. If this occurs, present the cock to a different hen. If eggs are infertile during the early part of the breeding season, this is usually caused by infertility in the cock. The hen will generally lay an egg every 3 days during the breeding season.

**Sings of breeding emus**

- The male rubbing against the fence to the extent that he has removed feathers
- Feathers scattered about the pen
- Tail feathers on female broken off or ruffled
- Now black feather growth on neck of female where male has been pecking her during intercourse
- The male walking very close to the female as she struts or both birds strutting together
- The female strutting for the male and then pecking him on the neck
- The male pecking the female on or near the tail to encourage her to sit down
- The male leaning on the female as he walks with her in an effort to get her to sit down
- Increased grunting from the male and booming from the female

**Actual Breeding**

Emu breeding will begin roughly 50 to 54 days before to lay the first eggs. The eggs the male fertilizes during each sexual act don't show up for 50 to 54 days. When breeding both birds will drop to their knees. The female will lean forward on her chest with her posterior in the air, flex the tail feathers and expose the vent. If there has been some earlier fighting between the pair the male may approach from several feet away on his knees to avoid alarming her. A well matched pair will see the male walking up and dropping to his knees right behind her. The male will walk on his knees to get into position and mount her. As he ejaculates, he will peck her on the neck.
Egg production and laying pattern

First egg is laid around two and half year age. Eggs will be laid during October to March particularly cooler days of the year. The time of egg laying is around 5.30 PM to 7.00 PM. Eggs are normally laid in a shallow scrape, which is a small hole in the ground. Eggs can be collected twice daily to avoid damage in the pen. Feed the breeder ration with sufficient calcium (2.7%) for ensuring proper calcification of egg with strength. Feeding excess calcium to the breeding bird before laying will upset the egg production and also impairs the male fertility. Provide extra calcium in the form of grit or calcite powder by placing in a separate trough. Normally a hen lays about 15 eggs during first year cycle in subsequent years the egg production increases till it can reach about 30-40 eggs. On an average a hen lays 35 eggs per year. Egg weighs about 475-650 g with an average egg weight of 560 g in a year. Egg appears greenish look like tough marble. The intensity of colour varies from light, medium to dark green. The surface varies from rough to smooth. Majority of eggs (42%) are medium green with rough surface. Collect eggs frequently from the pen. If eggs are soiled, clean with sand paper and mop up with cotton. Store the eggs in a cooler room providing 60⁰ F. Never store eggs for more than 10 days to ensure better hatchability. Eggs stored at room temperature can be set every 3 to 4 days for good hatchability.

Problems in laying emus

The following are the common problems observed during the laying season in hen emus.

<table>
<thead>
<tr>
<th>Laying problem</th>
<th>Description</th>
<th>Cause</th>
<th>Prevention / treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft shelled eggs</td>
<td>Many emu hens lay one or two soft shelled eggs during the course of the breeding seasons is normal. A large number of soft shelled or very thin shelled eggs, however, can indicate the abnormal.</td>
<td>Calcium, vitamin D₃ deficiency in the diet, inflammation of oviduct or infection, intestinal parasites</td>
<td>Supplementation of calcium, vitamin D₃</td>
</tr>
<tr>
<td>Infertile eggs</td>
<td>In fertility in emu is male problem</td>
<td>Semen abnormality or abnormal calcium and phosphorus ratio (3:1 or 4:1 or higher)</td>
<td>Maintain calcium and phosphorus ratio in the male diet, periodical semen evaluation and removal of male from the breeding flock</td>
</tr>
<tr>
<td>Condition</td>
<td>Description</td>
<td>Cause</td>
<td>Treatment</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Egg bound condition</td>
<td>Hen emu is unable to lay the egg. The egg stuck in the lower part of the oviduct. The bird is seen to sit down and stand up repeatedly as her attempts to lay continue to be futile. The egg bound hen appears generally uncomfortable and stands hunched.</td>
<td>Low calcium in the diet, Slow bird metabolism in cold weather and so the muscular movements that bring the egg down the oviduct have also slowed.</td>
<td>Try to warm up the bird, warmed mineral oil generously greased the bird's cloaca and calcium injection.</td>
</tr>
<tr>
<td>Prolapsed oviduct / cloaca</td>
<td>Oviduct prolapsed via the cloaca</td>
<td>Unknown</td>
<td>Wash the prolapsed oviduct with Detadine solution and gently push it back in to the cloaca and proceed to put a strong purse-string stitch around the anus using silk thread. Be ensuring to leave about the thickness of a man index finger open for the bird to defecate through.</td>
</tr>
</tbody>
</table>