Introduction
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Poultry is one of the fastest growing segments of the agricultural sector in India today. One of the major challenges faced by the poultry industry in the developing world is about improving efficiency of production. To meet this challenge and maintain the efficiency of feed utilization, series of attempts have been made by researchers (Paryad and Mahmoudi, 2008). Stress susceptibility of chickens is a major problem in the modern poultry industry. As a result of stress, feed consumption, growth rate, feed efficiency, egg quality, fertility and chick quality were found to decline (Eid et al., 2008).

Under routine production conditions, various types of stress are experienced by chickens such as heat/cold, transport, preslaughter holding, ventilation and so on. Both high and low environmental temperatures stimulate the hypothalamo-hypophyseal-adrenocortical axis which may alter susceptibility of animals including the chicken to infectious diseases, resulting in production loss (Ramnath et al., 2008).

Stress is a state of threatened homeostasis provoked by physiological, psychological or environmental stress (Ramnath and Rekha, 2009). Exposure of birds to disease agents either by natural infection or vaccinations is a common form of stress. Although outright clinical disease may not occur, the immune system is usually disturbed and in some cases disease outbreak may occur due to poor immune response (Ogbe et al., 2008).

Oxidative stress arises from the imbalance between pro-oxidants and antioxidants in favour of the former, leading to the generation of oxidative damage (Halliwell and Gutteridge, 2007). Oxidative stress is an important factor underlying reproductive performance, cellular senescence and aging and so is an important fitness-related trait (Hulbert et al., 2007). Recent studies show that levels of pro-oxidants and antioxidants may also have relevant
ecological and evolutionary roles and may help understand functional interactions among life history traits (Costantini, 2008; Monaghan et al., 2009).

Reactive oxygen species are highly reactive molecules generated by biochemical redox reactions that occur as a part of normal cell metabolism (Mahmoud and Hijazi, 2007). The generation of reactive oxygen species during stress is often elevated to a level that overwhelms tissue antioxidant defense systems (Ayo et al., 2007). The magnitude of stress depends on the ability of the tissue to detoxify reactive oxygen species; that is, the level of antioxidant defenses in the body. It has been established that an important role of antioxidants is to control the potentially negative effects of oxidative stress (Costantini and Moller, 2009).

Reactive species are important in killing pathogens, but can as a negative side effect, also damage host tissues. This is particularly evident during chronic inflammation, which may cause extensive tissue oxidative damage with a consequent increase in oxidative stress (Sorci and Faivre, 2009). Free radicals produced under both normal physiological conditions and under stress conditions can have damaging effects on polyunsaturated fatty acids, DNA and proteins in the body. Antioxidant protection is vital for either prevention or substantial reductions in the damage caused by free radicals and products of their metabolism (Fisinin et al., 2008).

Infectious diseases impinge on animal productivity and diminish animal welfare (Klasing, 2007). Viral and bacterial diseases remain a threat to the poultry industry and countermeasures to prevent and control them are needed due to production losses. With the continued threat of exotic and emerging diseases and concern over the use of antibiotics in animal production, there is a serious and urgent need to find safe and practical alternatives to prevent or control pathogens (Kogut, 2009).

The health and well being of chickens depend upon the interaction between their genetic potential and exogenous factors like adequate...
nutrition, proper growth environment, reduced exposure to stressors and appropriate managerial practices. The genetic potential of a bird is dictated by early nutrition (Kidd, 2009). Nutrition has a pre-eminent role in promoting growth, development, immunity and reproduction. Micronutrients (vitamins and minerals) are required for the integrity and optimal function of living animal systems (Burgos et al., 2006).

Appropriate nutrition may aid in minimizing the incidence of diseases by enhancing immunity. Understanding the nutrition and immunity is important for optimizing bird health and productivity and will be an important contributor towards fulfilling the consumer’s conflicting demands for more natural production and better animal welfare (Klasing, 2007). Research studies have often showed that stressed birds require higher vitamin and mineral supply due to changes in metabolism, decrease in feed intake and reduced vitamin stability (Lagana et al., 2007).

Vitamin E is an important antioxidant which reacts with the lipid peroxide radical produced by a cycle of auto-oxidation, preventing it to react with a poly unsaturated fatty acid and is therefore called a chain breaking antioxidant (Barim, 2009). As vitamin E exists in the lipid components of biological membranes, it protects the cells and tissues against the negative effects of the free radicals that emerge as a result of oxidative stress with its chain breaking antioxidant effects (Yardibi et al., 2009).

Selenium is an essential trace element in human and animal nutrition and an integral component of antioxidative proteins. Organic selenium, a natural form of the element, is established to have more beneficial effects in maintaining antioxidative system than its inorganic form (Pirsijin et al., 2008). Selenium, an essential component of the enzyme glutathione peroxidase is found to improve the immune response of the birds by promoting higher leukocytes and enhanced humoral and cell responses (Lagana et al., 2007).
Metabolic functions of selenium are similar to vitamin E. A well known synergy exists between selenium and vitamin E. Selenium and vitamin E appear to participate in similar nutritional and bio-chemical relationships. They both act as the primer antioxidant by suppressing oxidative damages (Salman et al., 2007). Often selenium and vitamin E are supplemented together because they play similar physiological roles.

In the present study, an attempt was made to conduct a trial on the influence of dietary vitamin E and selenium supplementation independently and simultaneously to the layer chickens with the objective of studying the effect of vitamin E and selenium in the feed on the growth performance, immune response, production performance, egg quality characteristics and biochemical profile of layer chickens.

The study was conducted in two phases, involving the growing phase and laying phase of the birds. The growing phase included studies on the growth performance and immune responses of the layer chickens. The laying phase of the birds included studies on the production performance, egg quality characteristics and biochemical profile.