I. INTRODUCTION

Broiler production has been the fastest growing sub sector of Indian agriculture with a quantum jump with respect to broiler population as well as productivity, in the recent past. It has recorded an exponential 400-fold increase from four million broilers in 1971 to 1600 million broilers in the year 2004 (FAO, 2004). Poultry meat production in the country has increased 18 fold from 81,000 tons in 1971 to 1440,000 tons in 2004 (Anon., 2005). India today stands 5th in global poultry meat production, next only to USA, China, Brazil and Mexico, in that order (FAO, 2004). In spite of this achievement, the per capita availability of poultry meat in the country is only 1.5 kg, which is much lesser than the requirement of 10.5 kg, recommended by the National Institute of Nutrition (ICMR). Hence, there is an urgent need to increase the production of poultry meat to meet the requirement of the present population as well as the growing population.

Improvement in the genetic potential of hybrid broilers has accounted for 60% of the increase in production of poultry meat in the country. Broilers which achieved body weight of 1500 gm at 8 weeks of age with feed conversion ratio (FCR) around 3.0 during early eighties of the 20th century attain the same or higher body weight with FCR of less than two at present in less than five weeks time.

The import of genetically improved germplasm was the policy adopted in the earlier stages of broiler production in the country, but in the recent past, government has favored the establishment of pure line breeding programs, in both public and private sectors. Indian Council of Agricultural Research (ICAR) has taken up pure line broiler breeding programs through institutional projects like All India Coordinated Research Project (AICRP). The first phase of AICRP on poultry breeding was initiated in 1968-’70, with the diallel crossing for broiler production using some of the strains of pure line White Rock, White Cornish, Australorp and New Hampshire that were available in the country. Subsequently, a few genetic stocks of White and Red Cornish were imported from Israel and USA. Evaluation, selection and regeneration of each strain and evaluation of their performance in cross combinations were the main features of the investigation. While the import of grandparent stocks still continues, several synthetic stocks are being developed utilizing the commercial germplasm available in the country.
Broiler parent stock is to be selected not only for broiler traits such as growth rate, viability and feed efficiency of the commercial broiler, but also for their egg production and other reproduction traits for the viability of the operation. The differential contribution of sire and dam for the production of commercial broiler chicks and the negative genetic correlations between the growth and reproduction traits warrant the use of specialized male and female lines in broiler breeding. Accordingly, the center of AICRP on Poultry for Meat at Bangalore, under the Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, has been involved in maintaining pedigreed closed flocks of a synthetic colored broiler dam line (PB2) since 1994. The primary objective of selection is the improvement of body weight at five weeks of age.

Though early body weight is an important criterion of selection in broiler breeder dams, it is equally, if not more, important to have high production of settable eggs by broiler breeder dams, in order to enhance the number of chicks per breeder dam. Consequently, it has become a common practice among the breeders to practice selection based on part term egg production for improving the egg production at later stages or the annual performance. This method, which was first advocated by Dempster and Lerner in 1947, has been proved effective by many later studies, majority of them being in egg type chicken (Natarajan and Rathnasabhapathy, 1972; Singh, *et al.*, 1984; Mishra, *et al.*, 1992; Ganesh Kumar *et al.*, 2004). Hence, if similar attempts are made in this broiler dam line (PB2), through selection for an early segment of part term egg production, around the peak production period, the possibility of further improving part term egg production of settable eggs may be explored. The length of the part record that is likely to produce greatest improvement in egg production at later stages can also be identified. This attempt may further be expected to improve the annual egg production as well as the number of chicks per broiler breeder dam for higher economic efficiency of production per unit time.

Egg production is a genetically controlled trait with a behavioral pattern specific to a breed or a line. It can also be expressed as a function of duration from which the bird is in production. Egg production generally increases to a peak and then gradually decreases in the form of a curve when summarized on a monthly or weekly basis. The use of appropriate mathematical models to fit such egg production curves accurately is of
great importance in practical poultry breeding. The egg production for any chosen period and annual or full term egg production can be predicted using such models. This kind of prediction information based on weekly records, for the egg production at later stages in the breeder lines, can facilitate their early selection thereby decreasing the generation interval. The behavioral trends in production like the time of peak and decline as well as the persistency of lay can also be studied from egg production curves. Such models also have the practical significance of giving a detailed analysis of the egg production cycle for timely management of housing dates, egg marketing and labor needs of the enterprise.

In the above context, the present study has been taken up to facilitate the genetic evaluation of a dam line of colored broilers. The study also aims at the genetic analysis of various segmented parts of egg production to enable the prediction of cumulative egg production up to 40 and 52 weeks of age from such segments in a broiler dam line. Further, the prediction of egg production trend of a broiler breeder line through egg production curves is virtually a new attempt, although similar studies have been undertaken on layer-type chicken (Singh et al. 1984; Sakunthala Devi, 2002; Joshi, 2005). The study was therefore taken up with the following objectives:

1. Estimation of genetic parameters for production traits in the selected line, PB2
2. Estimation of response to selection in production traits
3. Fitting of curves for egg production up to 40 weeks of age using mathematical models
4. Comparison of relative efficiency of different models fitted to explain part term production