INTRODUCTION

The pea (*Pisum sativum* L.) a common nutritious vegetable as well as pulse crop belongs to papilionaceae family of dicotile donae sub division of plant kingdom. The pea is grouped as *Pisum sativum* sub species hortiense. It’s origin can be traced back to stone age, Ethiopia is probably the main center of origin to pea. Pea probably originated in western Asia, north-western India, Pakistan or adjacent areas of former USSR and Afghanistan and therefore spread to the related zones of Europe (Key, 1979; Makasheva, 1983) non-pigment peas used as a vegetable, were grown in united Kingdom in the middle ages.

In a country like India, where a large population is vegetarian, the cheap and best source of protein is still pulses. Pulses constitute an important ingredient in predominantly vegetarian Indian diet. For the poor people, pea is a popular pulse crop. It provides a variety of vegetarian dishes and hence it is like throughout the world. India is a major pulse growing country of the world, accounting roughly for one third of the total area under pulses and one fourth of the world production. Pulse crops, also called grain legumes, have been valued as food, fodder and feed. Cereals constitute the staple food, and major source of energy. However, addition of pulses, which are the main source of vegetable protein in their diet, will provide nutritionally balanced food.

The year 2007-08 has been a successful year for pulses production in India, as for the first time it has crossed the mark of 15 million tones a long cherished goal. This has cemented the status of the country as the largest pulses producer in the world with 25 per cent share in global production from 32 percent area. (The Hindu survey of Indian Agriculture; 2008).

In developing countries like India, concerted efforts must be made to enhance the production and productivity of pulses, which in turn will ensure more availability to pulses on a per capita basis thus; it will ensure nutritional security to the poor masses of the country.

Besides being a rich source of protein, Pulses are also important for sustainable agriculture as they improve physical, chemical and biological properties of soil. Being leguminous, the pulse plants take so little and given so much to our soils that their significance in restoring and maintaining the soil fertility what we add through chemical fertilizers. Thus every pulse plant is a mini-fertilizer plant itself. Being deep rooted; these pulses are highly adaptive to dry land areas of the country. Their deep roots also open up the soils. Which ensure better aeration, the short duration pulses also fit well in the various cropping systems without disturbing the main cereal
crops. The pulse crop residues are nutritious feed for livestock and milch cattle and thus offer an added advantage to the poor farmer’s family.

The productivity of different pulses in quite low, mainly due to several agro-ecological, biological, institutional and socio-economic constraints. The major causes for low production are ecological factors; lack of appropriate pulse production and post harvest technology. It is grown over an area of 10.5 million hectares with a production of about 13 million tones (Singh 1997). Uttar Pradesh is a major pea growing state in India and U.P. alone produces about 75% of total pea produced in India. Besides U.P., M.P. and Bihar are major pea producing states. In India pea is grown in Rabi season and it requires a cool growing season, moderate temperature through out the growing season for germination, pea can be grown successfully in temperate and semi-arid zones.

Application of balanced fertilizer increases vegetative growth and improves yield and quality of the produce. As a grain legume, field peas are capable of fixing most of the required nitrogen from environment. The nutrients available to plant particularly nitrogen and phosphorus are important constituents of protein and phospholipids. Phosphorus not only enhances the root growth but also promotes early plant maturity (Mullins et al., 1996). Potassium is often referred as the quality element for crop production due to its positive interaction with other nutrients (especially with nitrogen) and production practices (Usherwood, 1985). It promotes synthesis of photo-synthates and transport to fruits and grains, and enhances their conversion into starch, protein, vitamins, oil etc. (Mengel and Kirkby, 1997)

Application of NPK to pea crop usually promotes vegetative growth and nodulation (Srivastava and Verma, 1985; Kanaujia et al., 1997; Vorob, 2000), and improves green pod yield (Naik, 1989; Saini and Thakur, 1996; Verma et al., 1997; Kanaujia et al., 1997 & 1998; Vorob, 2000). Vine length tended to increase as the rate of all the three nutrients increased (Cutcliffe and Munro, 1980). In pea, increasing phosphorus levels, generally increases green pod yield (Dubey et al., 1999) and yield components such as pod length, number of grains per pod and pod weight (Gupta et al., 2000). Parsad et al. (1989) applied P<sub>2</sub>O<sub>5</sub> @ 0, 40, 80 or 120 kg ha<sup>-1</sup> with or without *Rhizobium* inoculation of seed to pea crop. P<sub>2</sub>O<sub>5</sub> resulted in significant increase in growth, growth nodulation and yield, compared with the control. The highest green pod yield was obtained with combination of 120 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and *Rhizobium* inoculation. However, in separate experiments, Sharma et al. (1997) and Mishra (1999) found that pod yield increased by 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> in pea and cowpea, respectively with no further significant increase at the higher Phosphorus rate.
Pea has a relatively high requirement for phosphorus (P). Phosphorus is needed to promote the development of extensive root systems and vigorous seedlings. Encouraging vigorous root growth is an important step in promoting good nodule development. Phosphorus also plays an important role in the N fixation process. Pea planted on soils testing low in available Phosphorus or under cool or wet conditions may respond dramatically to Phosphorus fertilizer. As with cereals, yield responses are not always achieved when applying Phosphorus in the form of phosphate fertilizers. However, a pea crop may benefit from increased frost tolerance, resistance to disease, improved nodulation and N fixation and drought tolerance as a result of Phosphorus application.

Phosphorus is needed in relatively large amounts by legumes for growth and nitrogen fixation and has been reported to promote leaf area, biomass, yield, nodule number, nodule mass, etc., in a number of legumes (Berg and Lynd 1985, Pacovsky et al. 1986, Kasturikrishna and Ahlawat 1999). Some workers (Bressani and Elias 1980, Marzo et al. 1997) reported an increase in protein content with increased phosphorus application rate, while others (Henry et al. 1995) found no increase in protein content.

Therefore, keeping in view of the above-mentioned considerations and problems outlined, the present investigation entitled“ Effect of phosphorus levels on growth, yield and quality of different pea varieties (Pisum sativum L.)”. was carried out in Rabi season of 2007-08 and 2008-09 with the following objectives:

1. To study the effect of phosphorus on growth, yield and quality of pea varieties.
2. To find out the response of phosphorus for different pea varieties.
3. To study the effect of different treatment on uptake of phosphorus.
4. To work out the economics of different treatments under study.