

Rapeseed-mustard is the third important oilseed crop in the world after soybean (*Glycine max*) and palm (*Elaeis guineensis*). Among the seven edible oilseeds cultivated in India, rapeseed-mustard (*Brassica spp.*) contributes 28.6% in the total production of oilseed. In India, it is the most important edible oilseed after groundnut sharing 27.8% in the India's oilseed economy. Oilseeds contain 25 to 60% edible oil and these energy rich crops play an important role in human nutrition and animal feed, occupying a key position in the diet of Indian masses. The share of oilseeds is 14.1% out of the total cropped area after the cereals in India, rapeseed-mustard accounts for 3% of it. The rapeseed-mustard group broadly includes Indian mustard, yellow sarson, brown sarson, raya, and toria crops.

It is the paradoxical fact that India, which is one of the major oilseeds growing countries in the world, is not able to feed its population with regard to oils and had to import edible oils worth crores of rupees every year. The production scenario of rapeseed-mustard is not satisfactory. India produced 27.98 million tones of rapeseed-mustard in the year 2005-06 declined to 24.29 million tonnes in 2006-07 (Economic Survey, 2006-07 and 2007-08), which is much below the estimated production level to feed our population with our own crop.

Rapeseed-mustard is a common *rabi* crop in West Bengal, an eastern state of India, and the crop is cultivated over 8000 ha in the sub-himalayan plain which is situated at the northern fringe of the state that is in the foot hills of himalaya, known as *Terai* region. The climate of this region, in general, is sub-tropical, pre-humid in nature with distinctive characteristics of high rainfall, high relative humidity accompanied by low temperature particularly in winter months. *Terai* soils are mostly sandy to sandy loam in texture, porous and grayish black in colour. As a consequence of leaching of bases due to heavy rainfall (3000-3500mm per annum) in this region, soils are

mostly slightly acidic to acidic in nature, the organic matter content is medium to high some times of raw humus type. Phosphate fixation capacity is very high. Leaching of the plant nutrients causes deficiency of micronutrients such as zinc and boron which calls for correction to sustain the increased level of production of crops (Anonymous, 1999). Cooch Behar district covers a major part of the *terai* region. Though rapeseed-mustard is the major oilseed of this region, the productivity is very poor (below 500 kg ha⁻¹) compared to the state average productivity (Fig.1). The poor productivity might be due to the imbalanced fertilization that too in sub-optimal dose. Some times poor rather uneven crop establishment resulting less productivity. As a result the cultivation of rapeseed-mustard is now becoming less remunerative to the farmers of this region and as a consequence the area under rapeseed-mustard is gradually decreasing due to shifting towards winter maize, vegetables and potato.

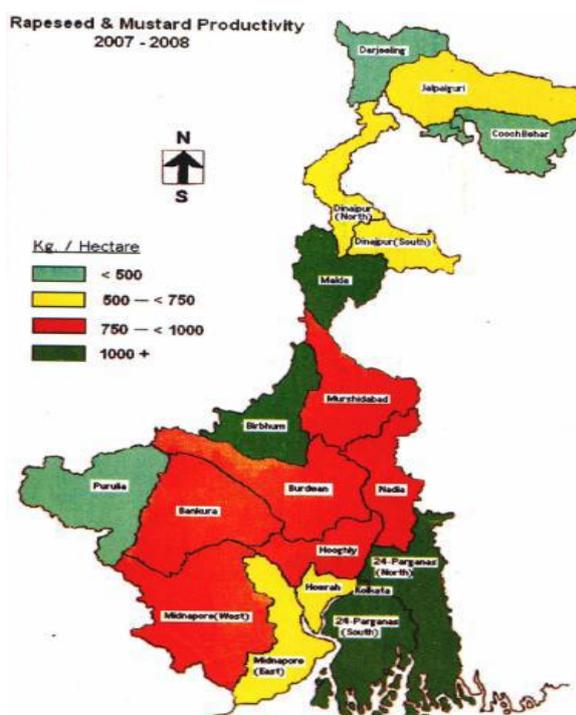


Fig. 1- Productivity scenario of rapeseed-mustard in the districts of West Bengal, India (Source: Directorate of Agriculture, Government of West Bengal)

Research had shown that the production of oilseeds could at least be doubled by adopting improved crop production technologies available now.

In present day agriculture, there is increasing concern about the sustainability in productivity of soils as a resource base to meet the demand of the escalating human population. The problem is more intense for a densely populated country like India where man has been exploiting the soil nutrients from time immemorial. Immediately after the dawn of independence, during 1951-52, the total food grain production of the country was merely 52 million tonnes with fertilizer consumption of only 70,000 metric tonnes. Since then, with the ever expanding population the demand of food grains has been increased many folds. Commensuration to this requirement, the country has adopted several mechanisms for increasing the quantum of food production. Since such high levels of production cannot be attained without external supply of adequate amount of nutrients. The use of fertilizers in the country has thus increased consistently, registering a total consumption of 18 million tonnes during 2005-06. However, in spite of the significant contribution of mineral fertilizers to the increased food production, a steady decline in fertilizer use efficiency for production of agricultural crops has now become a matter of serious concern. While average crop response to fertilizer use was around 25 kg during the initiation of green revolution in the country (Shankaram, 1995), this value has now come down to 8 to 10 kg only (Anonymous, 1999). So it is very clear that we achieved Food Mountain in exchange of soil health and sustainability in agricultural production. It is now also clear that nitrogen-driven systems are not sustainable and stable. The wagon of Indian agriculture in today's context cannot be pulled by a nitrogen dominated fertilizers use pattern when multiple nutrient deficiencies are rampant. Several experiments show that application of only nitrogen i.e N-driven system resulted depletion of phosphorus and potassium up to 130% and 150% respectively. It promotes soil's bankruptcy.

The gradual decline in the fertilizer use efficiency has been attributed to several factors by different workers. Some workers consider lack

of use of sufficient amount of organic matter in the nutrient management programme to be a major reason for such decline in fertilizer use efficiency (Bourguignon, 2005). However, many others have attributed this behaviour to use the plant nutrients below the required levels and also to imbalanced application of fertilizers.

With almost twice the quantity of plant nutrients being removed from the soil than what is added through fertilizers, the growing plant nutrient imbalance poses a major threat to sustain soil health and crop productivity in India. The need for continued increase in food and fodder production to meet the ever expanding human and livestock population and inadequate domestic fertilizers supplies coupled with the inability of chemical fertilizers to maintain long-term soil health and crop productivity in intensive cropping system have underlined the need for integrated nutrient sources such as chemical fertilizers, organic manures, bio-fertilizers etc. (Hegde *et al.*, 1999).

In the *terai* region of West Bengal, poor crop stand establishment of yellow sarson also occurs due to heterogeneity in the seed lots and some where after harvesting of the *kharif* rice, the residual moisture decreases rapidly, mostly in the upland situation which sometimes causes poor emergence of rapeseed-mustard, leading to poor productivity.

Towards sustainable agriculture quality seed is the one of the major components for production of a good crop. Research works are being carried out to progress towards the sustainable seed management practices, which can be a step forward towards the supply of seeds without affecting the yield. One such research is the application of pre-sowing treatments, which are given to the seeds just before sowing to achieve the desired goal. Pre-sowing seed soaking not only homogenizes a seed lot, but this practice also gives a good crop stand to combat the adverse field condition like moisture stresses, suboptimal and optimal temperature stresses. It enhances metabolic activities and respiration rates by activating of enzymes involved in metabolism of seed reserves (Mauromicale and Cavallo, 1995) which gives a seed an earlier and

increased germination, better and uniform field establishment. Improved emergence, dry matter accumulation as well as increased seed and oil yield in Indian mustard can be achieved through treating the seeds before sowing (Paul *et al*, 1999).

Keeping the above facts under consideration, this field experiment was undertaken to investigate the "Effect of integrated nutrient management and seed soaking agro-chemicals on growth and yield of yellow sarson (*Brassica rapa* var. *glauca*) in *terai* region of West Bengal" with the following objectives:

- I. To evaluate the growth and yield performance of yellow sarson under integrated nutrient management.
- II. To study the performance of different pre-sowing seed soaking treatments on emergence, growth and yield of yellow sarson.
- III. To find out the nutrient uptake and residual soil fertility status as influenced by pre-sowing seed treatments and integrated nutrient management in yellow sarson.
- IV. To study the production economics of yellow sarson.