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Relationship between plant growth, biomass and seed yield under moisture stress and nonstress conditions in mustard (*Brassica campestris* cv. VARUNA)

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SUMMARY
Plant growth and productivity is negative affected by moisture stress. Moisture stress in natural environments usually arises due to lack of rainfall, a condition known as drought stress. Under drought conditions yield is determined by water use efficiency. This character showed significant genetic variability and heritability. Indian mustard is mostly grown as timely as well as and late sown crops about 40 percent of the total crop in the country is occupied under late sown-irrigated conditions. These crops have been found to suffer from heat stress and drought stress. Therefore, it becomes necessary to select such varieties which thrive reasonably well under stress conditions.The influence of different magnitudes of soil moisture stress on metabolic factors in relation to yielding potential was studied in *Brassica compestris var. Varuna* at flowering with increase in stress in intensity, leaf water potential, R.W.C. and leaf area declined significantly. Stress substantially reduced the seed yield, pod number, oil and protein contents in seeds, Metabolic factors such as nitrate reductase (NR) activity and chlorophyll content decreased significantly under severe stress with increase in protein and free proline in leaves.

Key words : Mustard, Moisture, Production.

Oil seed crops play an important role in agricultural economy in India. Mustard is major *Rabi* oil seed crop of northern India. It occupies a prominent position next to ground nut. There various oiliferous *Brassica* grown in India important among these are Indian mustard *Brassica juncea (L.)* Toria (*Brassica campestris var. toria)*, Brown sarson or mustard popularly known as rye gained imprance on account of this being widely cultivated in almost all the growing conditions and ecogeographic region in country.

Sensitivity of seed yield to water stress during specific stages of growth is important for the development of improved management practices and cultivar in drought prone areas. Many environmental stress and weather induced loses affect yield but an individual breeder might only need to contend with a few.

Drought stress, as an example of the most prevalent form of environmental stress, does not have to take the form of a catastrophe in order to constitute a problem. Short periods of lack of rainfall are common in rain fed agriculture and such periods are decisive in reducing yields. Drought resistance at metabolic level is last under stood in terms of yielding potential and stability of crop plants. The metabolic responses such as proline accumulation (Boggers and stewart 1980; Handa et al. 1986, Veeranjuneyulu and Kumari, 1989) decreased NR activity (Morilla et al. 1973, Larson et al. 1989) and instability of chlorophyll protein complex (Pell and Dam 1991) are well documented but their precise significance in drought resistance with respect to yield stability and biomass production.

Water stress at reproductive stages have a greater effect on grain yield compared to other stages (Choudhary et al., 1985).

Thus, selection for adaptation to low moisture situations may, therefore, be desirable to improve its production potential (Chauhan and Bhargava 1984). Breeding practices thus requires identification of definite stress tolerance attributes and their transfer into high yielding and agronomically acceptable cultivars.

MATERIALS AND METHODS

The seeds of Mustard (*Brassica campestris var. Varuna)* were sown in glazed cylindrical pots (area 7566 cm^2) on October 22,2003 under natural out door conditions. Prior to sowing, the sandy loam soil was mixed with 0.5 kg. of well rottled fard yard manure. A calculated does of Nitrogen (2gm. Per pot), Phosphorus (1 gm. Per pot) and potassium (1gm per pot) was given at sowing time. Another does of Nitrogen (1gm. Per pot) was applied 40 days after sowing (DAS). The plant stand was thinned to three plants per pot until maturity from seedling establishment.

Soil moisture stress of different magnitudes i.e. mild (50% of control), moderate (35% of control) and several (20% of control) was induced at 100% flowering (DAS) by partial with olding to give required magnitude or by completely with olding irrigation. The control plants were adequately watered at regular intervals to keep the soil near field capacity. The plants showed distinct wilting symptoms three weeks after stress initiation in morning hours only under severe stress, these were subsequently reirrigated (recovery) until maturity (stress revived).

Water relations were studied in the fifth, sixth and seventh leaves from the top on main stem and data are presented as mean values.

The soil moisture content (SMC) at 20 cm depth was determined gravimetrically between 11 and 12 hr, values are expressed as percentages on a wet weight basis. The