Abstracts

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Strategy for Breeding for Early—maturity in Groundnut

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ABSTRACT

Groundnut (*Arachis hypogaea* L.) is an important oilseed and food crop cultivated in about 96 countries of the world with an annual production of 34.5 million ton 23.8 million ha in 2000. The crop productivity in the semi—arid tropics (SAT) regions is low (< 1 t ha^{-1}) compared to more than 2.6 t ha^{-1} of the developed world. One of the main reasons for low productivity in the SAT regions is non—availability of early — maturing, high — yielding groundnut cultivars, which can match the short growing season and can avoid late season droughts. For an efficient trait—specific breeding strategy, it is important to have sources of proven ability, an efficient selection procedure in the segregating populations based on proper understanding of inheritance of the trait, and an appropriate testing mechanism/procedure for advanced breeding lines with minimum seasonal variation. In groundnut, several sources of early—maturity have been reported. However, only a few (Chico, Gangapuri, JL 24; mainly Chico) have been used in most of the breeding programs. Our understanding of inheritance of early—maturity remains inconclusive. From one to many genes responsible for early—maturity are reported in literature. Moderate to high heritabilities are reported for traits associated with early —maturity. In this paper we outline a procedure for breeding for early—maturing, high—yielding groundnut varieties that we follow at ICRISAT Center, India. The desired crop duration generally varies from 90 to 110 days in the SAT regions. Temperature is the dominant environmental factor that influences groundnut growth and development. However, it varies among locations and among seasons at a location. Therefore, we use cumulative thermal time (measured in degree days, ℃d) instead of calendar days in breeding for early—maturity. Considering 10℃ as the base temperature for groundnut, we opted for two thermal times, 1240℃d (equivalent to 75 days after sowing (DAS) in the rainy season at ICRISAT Center) and 1470℃d (equivalent to 90 DAS in the rainy season at ICRISAT Center) in selection for early—maturity. Segregating populations, generated by iovolving early—maturing sources/breeding lines and high—yielding

adapted cultivars, are harvested when the crop has accumulated 1470°Cd. In the early generations (F_2—F_4), single plants with high proportions of well—filled mature pods are selected in the field. These plants are evaluated in the laboratory after shelling and only those with high proportions of sound mature seed are retained. In F_5 and later generations, the bulks of phenotypically uniform plants with high proportions of well—filled mature pods are given ICGV (ICRISAT Groundnut Variety) number and evaluated in replicated trials along with suitable controls for early—maturity and yield. The yield trials at the preliminary stage are harvested at 1240°Cd, at theadvanced stage at 1470°Cd, and at the elite stage at both 1240°Cd and 1470°Cd. At each stage, pod yield, shelling percentage, and 100—seed weight are considered in advancing the lines to the next stage. At the elite stage, we consider increase in pod yield, shelling percentage, and 100—seed weight from 1240°Cd to 1470°Cd as important criteria of early—maturity, the lesser the increase, the better the potential of lines for early— or extra—early—maturity. The breeding lines with high pod yields and shelling percentages at both harvests but with lesser increase in pod yield, shelling percentage, and 100—seed weight from 1240°Cdto 1470°Cd compared to controls are finally selected for multilocational evaluation. The breeding lines developed following this approach have been released as early—maturing cultivars in India, Vietnam, Pakistan, Nepal, Bangladesh, Myanmar, and Zimbabwe. Incorporation of moderate levels of resistance to important biotic and abiotic stresses and diversification of early—maturity sources are important areas of our current research.

Key words: groundnut, early—maturity, temperature, thermal time, pod yield, shelling percentage