[OP-25]

Selection of Winter-Hardy Genotypes and Determination of Some Agricultural Characteristics in Hybrid Pea Lines (F3)

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This study was carried out to select winter-hardy pea genotypes and to determine some agricultural characteristics. In the study, lines in the F3 generation obtained by crossing the wild pea genotypes collected from nature with the bred varieties and lines were used (91 lines). Planting of the lines was done in rows with a length of 2 m in 50 cm row spacing, 20 cm in row spacing, and 5 cm planting depth. The experiment was carried out in the experimental field of Selçuk University Faculty of Agriculture in the growing season of 2020/2021. Maintenance procedures such as irrigation, fertilization and weed control, which are necessary for the healthy growth of plants, have been carried out. In this study; Winter damage, disease damage, number of flowering days, number of main branches, plant height, number of pods per plant, number of seeds per pod, number of plants reaching harvest maturity and seed yield were emphasized. Winter damage was not seen in 38 lines; disease damage was not seen in 72 lines; the number of flowering days varied between 146-176 days; the number of main branches varied between 1-10; plant height varied between 45-125 cm; the number of pods per plant varied between 10-39; the number of seeds per pod varied between 2.67-7.67; The number of plants reaching the harvest maturity ranged from 1-10 and the seed yield per plant was between 4.29-101.2 grams.

Keywords: peas, seed yield, number of seeds, number of main branches

[OP-26]

Modifying Flowering time by Using Vernalization, Photoperiod and Earliness Genes in Winter Wheat to Increase the Adaptability of Wheat in the Era of Climate Change

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Global warming is expected to change the duration of the vegetation period that would also lead a shift in the timing of phenological phases resulting a drastic impact on the productivity of winter crops. The wide adaptability of wheat is largely controlled by three genetics factors; vernalization (Vrn), photoperiod (Ppd) and earliness per se genes including plant status. The combinations of these alleles effect the adaptability of wheat by affecting heading time and altering the phenological phases. Flowering date in bread wheat is determined by Vrn, photoperiodic sensitivity (Ppd) and earliness per se (Eps) genes. The aim of this study was to study the effect of Vrn, Ppd and Eps genes on heading date (HD) in winter wheat in controlled environment and exploring the possibility of altering the phenological phases of the winter wheat. The allelic composition of two winter wheat cultivars, Karahan and Sönmez for above mentioned genes were determined and each of them were crossed with two different unknown genetic make-up of winter wheat genotypes. Though Sonmez and Karahan are winter wheat cultivars, their allelic combinations for the above-mentioned genes are different. Both cultivars do not have 1B1R rye translocation which is associated with good adaptability but with bad grain quality. F1 and F2's of the crosses was grown in the field and 200 F2:3 randomly selected seeds of each 4 populations were grown under controlled environment. Plants were vernalized for 4 weeks in a cold chamber under 4 0C degree before transplanting into the controlled conditions. After the vernalization treatment completed, the plants were transplanted into greenhouse (GH). Heading dates of each plant in the populations after transplanting into GH were determined at the stage ears emerged fully from the boot. Wide range of heading dates were observed in each populations indicating it was possible to select early or later genotypes.

In populations when one parent was Karahan, while the HD range was 43-72 days in one population, it was 54-68 days in the second populations. In one parent Sonmez populations, HD range was 46-72 days and 29-70 days in the first and second population respectively. In all populations, some plants did not reach to heading; their percentages in the populations were different changing from 20.7 % to 37.5 %. The results indicate that the suitable genotypes can be selected for different Agro-Ecological Zones (AEZ) to increase the adaptability of the genotype to that AEZ. Purity of cultivars used in this study for Vrn, Ppd and Eps genes is questionable due to high variation both in Karahan and Sonmez in HD.

Keywords: Winter wheat, Vernalization, Photoperiod, Earliness

[OP-27]

CIMMYT's Approach to Speed Breeding for Spring and Winter Breeding Programs

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In recent breeding efforts, a significant amount of time, space and resources are used to find effective ways to develop best varieties in as short a time as possible. Speed breeding (SB) achieves this shorter cycle for breeding through rapid generation advancement and thereby accelerates the research. The combined effect of prolonged exposure to light under controlled conditions together with early harvesting of fast-maturing plants shortens the generations. Hence, the SB method becomes a promising approach contributing to nutritional security and sustainable agriculture for food and industrial crop enhancement.

After having long years of studies on Spring Wheat Breeding, CIMMYT established its well-designed its rapid breeding facility at Toluca in 2020. Using a low-cost operation, scientists use an in-field screenhouse spanning 2 hectares, and obtained 4 generations of spring wheat per year, thereby reducing the time needed for the development of new germplasm ready for yield testing to under 2 years. CIMMYT integrate different traditional and advanced genomics-assisted breeding technologies in their research like Genomic Selection (GS) and Genomic Estimated Breeding Values (GEBVs) to achieve faster and more accurate results and serve as a decision-making tool for breeders.

In winter wheat breeding, classic breeding methods take 12-13 years from initial crossing to obtaining variety candidate lines, and this time can increase to 15 years in total when the registration of the new variety from these lines and the process of delivery to the farmers are considered. Using the rapid breeding technicques, it becomes possible to obtain 6 generations per year in plants such as spring wheat, durum wheat, barley and peas and 4 generations in canola. 6 generations in a year can be ensured with spring wheat as the need for cooling, which is absent or very little. However, unlike spring wheats, winter wheat requires 4-6 weeks of vernalization to pass from the vegetative period to the generative period and this differs between varieties. The initiatives to apply speed breeding to winter wheat was started by the International Winter Breeding Program at a greenhouse facility established at the Aegean Agricultural Research Institute in 2018. The greenhouse provides controlled consitions for 25,000 single plants. With winter wheat lines which were planted at controlled greenhouse conditions – exposed to LED Lightening System for 22h/per day for 10 weeks reaching harvest maturity, only 3 generations were obtained within 13 months. According to the initial results obtained from the spring and winter wheat speed breeding activities, it is seen that the rapid breeding can accelerate obtaining new varieties by shortening the generation process, give a different dimension to the research and development studies achieving the result promptly, and contribute economically in the long run despite the high initial establishment costs.

Keywords: Speed breeding, winter wheat, spring wheat, genome selection, vernalization