ABSTRACT

Forty genotypes of pea (*Pisum sativum* L.) originating from different growing ecologies were collected from Division of Germplasm Collection and Exploration, National Bureau of Plant Genetic Resources Pusa, New Delhi. These genotypes were planted in the field at two sites viz., Mountain Research Centre for Field Crops (MRCFC) Khudwani Anantnag, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Jammu and Kashmir i.e. location I and Kisan (PG) College (KPGC), Simbhaoli, Hapur Uttar Pradesh, i.e. location II to obtain fresh seed for two different vigor tests. The two month old seeds from both the seed sources were subjected to different vigor tests in the laboratory viz. hundred seed weight, speed of germination, seedling root length, seedling shoot length, total seedling length, fresh seedling weight, dry seedling weight, vigor index I and vigor index II, electrical conductivity and viability test. Genotypic differences were highly significant for all the traits studied in both the seed sources and a wide range of variability was observed. Phenotypic coefficient of variance, genotypic coefficient of variance, heritability and genetic advance and correlations among various traits were detected. In the seeds produces from both the seed sources, the estimates of PCV were higher than the estimates of GCV for all the characters, which indicate the presence of environmental influence. The estimates of heritability were high for all the characters ranging from 0.76 to 0.99 for speed of germination, 100 seed weight, fresh seedling weight and electrical conductivity for the seeds raised at both the seed sources. Speed of germination had significant and positive phenotypic correlation with vigor index I, total seedling length and fresh seedling weight in seeds from both seed sources. Highly significant and positive phenotypic correlation was also observed between total seedling length and fresh seedling weight and vigor index I from both seed sources. Vigor index I exhibited highly significant and significant positive phenotypic correlation with total seedling length, fresh seedling weight, speed of germination, germination percentage and 100 seed weight, dry seedling weight respectively from seeds produces at both locations. The electrical conductivity possessed highly significant negative phenotypic correlation with speed of germination, total seedling length, fresh seedling weight and vigor index I and vigor index II in seeds produced from location I. In the seeds produced at location II, although electrical conductivity showed similar negative phenotypic correlation with, speed of germination, total

seedling length, fresh seedling weight and vigor index I, it showed non significant phenotypic relationship with vigor index II. Three genotypes IC-208375, EC-398602 and NBP-82 were found superior in respect of majority of vigor characteristics. For genetic studies three high vigor genotypes were selected as testers (IC-208375, EC-398602 and NBP-82) and twenty low vigor genotypes were selected as lines (EC-538008, IC-417878, IC-208366, IC-267127, DMR-7, IC-424886, IC-267162, IC-417586, IC-267151, IC-208364, EC-398599, IC-424895, DMR-11, IC-208385, EC-342007, EC-538004, IC-424896, IC-267181, IC-208368 and EC-538005). These twenty-three genotypes were crossed in a line x tester design. F1 seeds were used for vigor tests in the laboratory and for field studies along with their respective parents. The data was subjected to analysis of variance, phenotypic coefficient of variance, genotypic coefficient of variance, heritability and genetic advance and correlations (parents), heterosis, combining ability and gene action involved. The analysis of heterosis revealed that there was appreciable heterosis for line, tester and line x tester in almost all field characters studied. The case was same for laboratory characters as well except for fresh seedling weight, 100 seed weight, speed of germination and seedling root length. The significant positive and negative heterosis was observed for mid parent as well as better parent for different field and laboratory traits. Combining ability analysis indicated that the good general combiners for most of the field characters included EC-538008, IC-267127, IC-267162, DMR-11, IC-208385, EC-342007, IC-424896, IC-208368 and NBP-82. The parents EC-398599, IC-424896, IC-267127, IC-208368, DMR-7, IC-208366, IC-267162, and IC-208364 were good general combiners for seed yield per plant. The good general combiners for most of the laboratory characters included EC-538008, IC-417878, DMR-7, IC-267162, EC-398599, IC-208385, IC-208385, DMR-11, IC-208368, IC-417586, EC-538005 and IC-208364. The good general combiners for vigor indices included EC-538008, IC-267162, IC-208368, IC-417878, DMR-11 and EC-538005. Based on the genetic component analysis, both additive and dominant components appeared important in the inheritance of most of the traits. Additive type of gene action was observed for seed yield per plant; however non-additive gene interaction appeared playing an important role in controlling speed of germination, seedling root length, and vigor indices.