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Research Article

Graphical analysis for fruit yield and its component traits in chilli (*Capsicum annuum* L.)

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Abstract
Present investigation is carried out with eight diverse genotypes of mild pungent chilli (*Capsicum annuum* L.) and generated twenty eight F_1 crosses through 8 × 8 half diallel mating design, it was found that a lot of diversity present with respect to all the traits as depicted by scattered positions of parental arrays in the Wr-Vr graphs. The present study indicated that existence of both additive and non-additive genetic variances for inheritance of most of the traits. The graphical analysis revealed that plant height, primary branches per plant, secondary branches per plant, fruit length, fruit girth, fruit shape index, fruit weight, green fruit yield and moisture content in fruits were controlled by partial dominance. Whereas, complete dominance was observed for days to flowering and weight loss in fruits. The over-dominance played a role for the inheritance of fruits per plant, pedicel length, seeds per fruit and 100 seed weight. Moreover, the complementary type of gene interaction for the control of traits like fruit weight, 100 seed weight and weight loss in fruits in some of the parents was also observed.

Key words
Chilli, Half Diallel, Graphical analysis and Vr-Wr graph

Introduction

Chilli *(Capsicum annuum* l.) is one of the important vegetable crops grown in India. Diallel analysis helps in understanding the genetic control of the trait, which guides the breeder to advance and select segregating populations. There are several approaches available for analysis of diallel crosses but the two main approaches being followed are Griffing's and Hayman's approaches. These two approaches are often used together for complementary data interpretation. The analysis has been used successfully by various scientists in peppers (Baseerat *et al*., 2013) and in brinjal (Biswajit *et al*., 2004 and Hussain *et al*., 2018).

The nature of gene action involved in the inheritance of various characters is very important to decide any breeding methodology for crop improvement. This can be determined by graphical approach (Vr-Wr graph). To test the validity of the assumption, relation between the variance (Vr) and parent offspring covariance (Wr) of the same array and linear regression coefficient of Wr on Vr over arrays provides adequate means. The Vr-Wr statistic provides an estimate of the relative number of dominance to recessive genes present in the

common arrays of the parents, with the Vr and Wr statistics, calculated from diallel tables, graphs can be drawn and the geometric representation of these statistics can be interpreted. The position of the regression line in the graph indicates the degree of dominance and we can construct parabola limits in this graph. The interpretation of the results of this analysis is easy and straight forward if the main assumptions of the diallel analysis are fulfilled. The present investigation was planned to assess the gene action in all the ways for different quantitative characters in chilli that could be utilized in specific breeding programme for achieving fruitful results.

Materials and Methods

The basic materials for the present investigation consisted of eight diverse genotypes of chilli (*Capsicum annuum* L.) *viz;* Kumathi, KTPL 19, IVPBC 535, ACS 01-1, AVNPC 131, ACS 03-13, ACS 03-14 and SG 5. These lines were selected for the present study on the basis of diversity for various morphological traits. As far as pungency is concern, these lines were estimated very low to non pungent. Twenty eight F_1 crosses were generated through 8 x 8 half diallel mating design at Main Vegetable Research Station, Anand (Gujarat). The final experimental materials consisting of eight parents and twenty eight F_1 crosses were evaluated in randomized block design with three replications. The observations were recorded for fifteen characters *viz*; days to flowering, plant height (cm), primary branches per plant, secondary branches per plant, fruits per plant, fruit length (cm), fruit girth (cm), pedicel length (cm), fruit shape index, fruit

weight (g), green fruit yield per plant (g), seeds per fruit, 100 seed weight (g), moisture content in fruits (%) and weight loss in fruits (%). Recommended package of practices were adopted to raise a healthy crop. The graphical analysis was done according to Hayman (1954).

Results and Discussion

The pooled Vr-Wr graphs are presented in Figures 1 to 16. The scattered position of parental arrays in the Vr-Wr graphs indicated that a lot of diversity was present with respect to days to flowering, plant height, secondary branches per plant, fruit length, fruit girth, fruit weight, seeds per fruit, 100 seed weight, moisture content in fruits and weight loss in fruits. Graphical analysis for primary branches per plant, fruits per plant, pedicel length, fruit shape index and green fruit yield per plant revealed that some of the parental arrays were clustered around the regression line indicating little diversity for these traits.

The relative position of the parental points along the regression line indicated the distribution of dominant and recessive genes in the parents. The location of array points nearer to the point of origin and far away from the point of origin suggested higher proportion of dominant and recessive genes in the parents, respectively. A higher proportion of dominant genes observed in the parents Kumathi for plant height, secondary branches per plant, fruit length, fruit girth, fruit weight, seeds per fruit and moisture content in fruits; KTPL 19 for days to flowering, plant height, primary branches per plant, secondary branches per plant and moisture content in fruits; IVPBC 535 for secondary branches per plant, fruit length, fruit girth, moisture content in fruits and weight loss in fruits; ACS 01-1 for plant height, fruit weight and weight loss in fruits; AVNPC 131 for days to flowering, plant height, secondary branches per plant, fruit weight and green fruit yield per plant; ACS 03-13 for plant height, secondary branches per plant, pedicel length, fruit weight, 100 seed weight and weight loss in fruits; ACS 03-14 for primary branches per plant and seeds per fruit and SG 5 for secondary branches per plant, fruit girth, fruit weight, seeds per fruit and moisture content in fruits.

On the other hand, higher proportion of recessive genes were manifested in the parents Kumathi for pedicel length and 100 seed weight; KTPL 19 for fruit girth, fruit shape index, seeds per fruit and 100 seed weight; IVPBC 535 for fruits per plant, pedicel length, green fruit yield per plant and 100 seed weight; ACS 01-1 for fruits per plant, pedicel length and 100 seed weight; AVNPC 131 for primary braches per plant, pedicel length and fruit shape index; ACS 03-13 for primary branches per plant, fruits per plant ,fruit length and fruit shape index; ACS 03-14 for days to flowering, pedicel length, fruit shape index, fruit weight, moisture content in fruits and weight loss in fruits and SG 5 for pedicel length, fruit shape index, green fruit yield per plant and weight loss in fruits.

The graphical analysis indicated that plant height, primary branches per plant, secondary branches per plant, fruit length, fruit girth, fruit shape index, fruit weight, green fruit yield and moisture content in fruits were controlled by partial dominance. Whereas, complete dominance was observed for days to flowering and weight loss in fruits. The over-dominance played a role for fruits per plant, pedicel length, seeds per fruit and 100 seed weight. Parents which exhibited complementary type of gene interaction were KTPL 19 for fruit weight and weight loss in fruits and ACS 03-14 for 100 seed weight. Most of the findings results have also been corroborated with the reports of Sousa and Maluf (2003) and Baseerat *et al*. (2013) for various traits in chilli.

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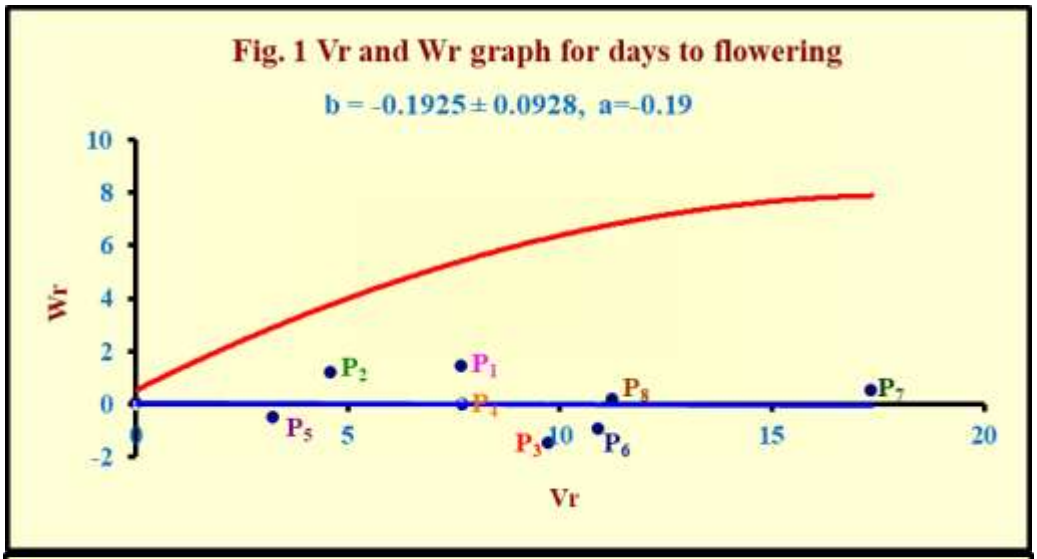

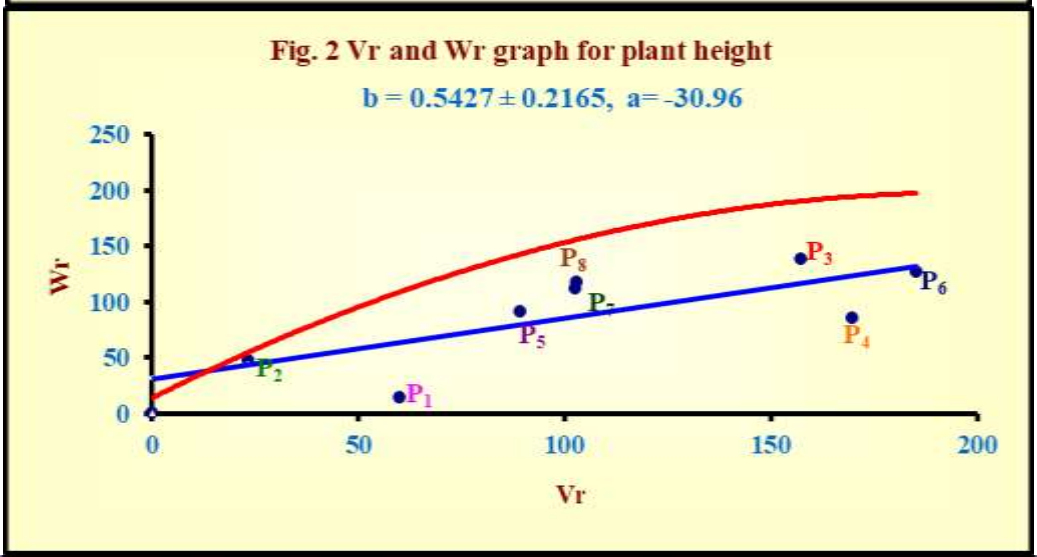

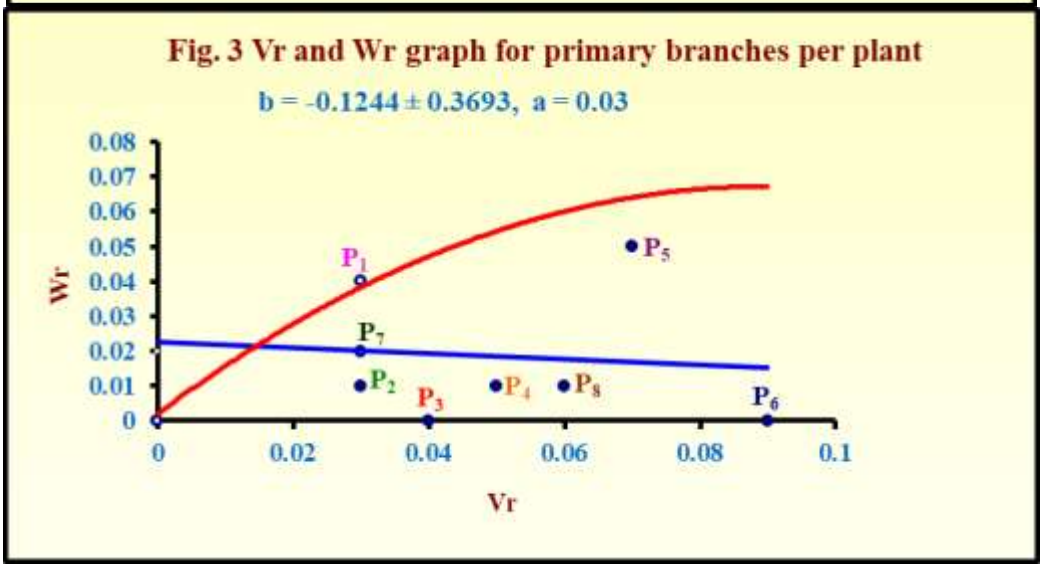

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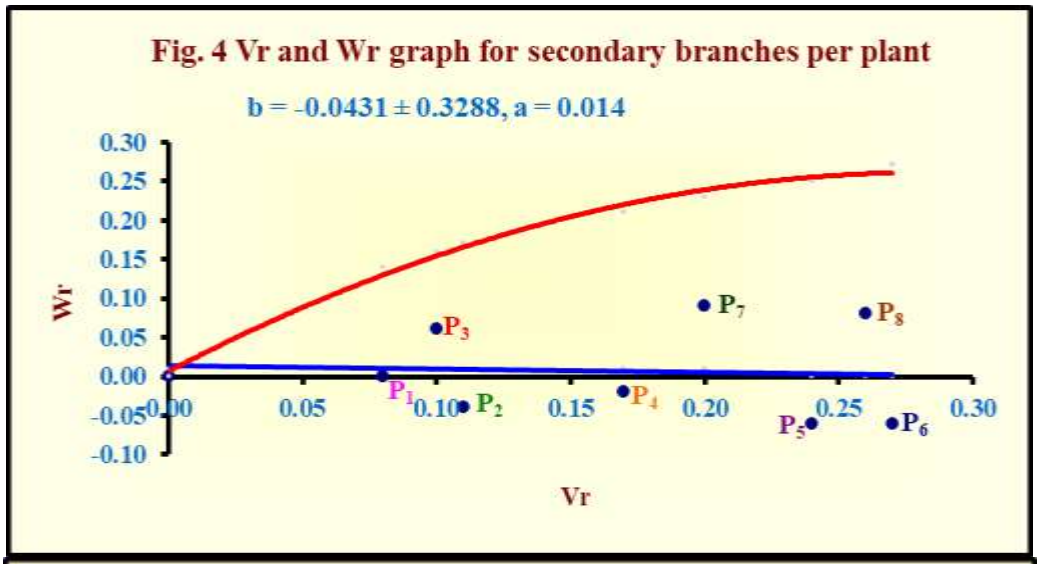
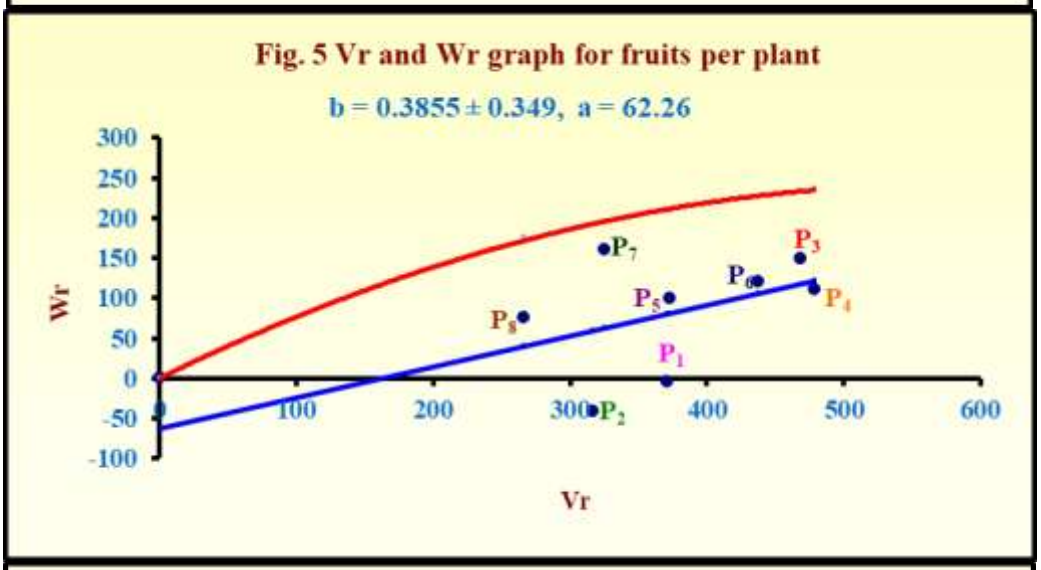
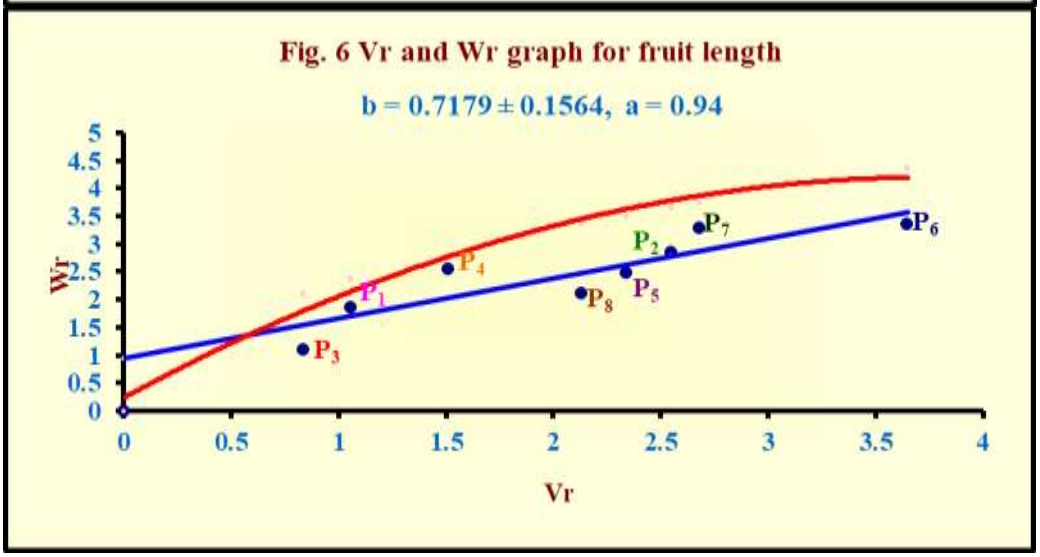
P_3	IVPBC 535	P_7	ACS 03-14
P_4	ACS 01-1	P_8	SG 5







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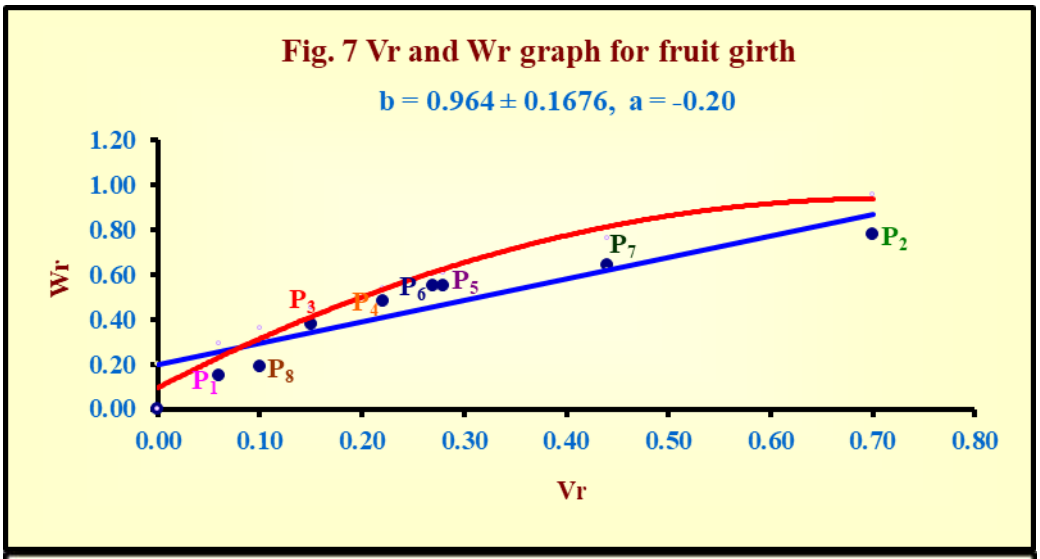

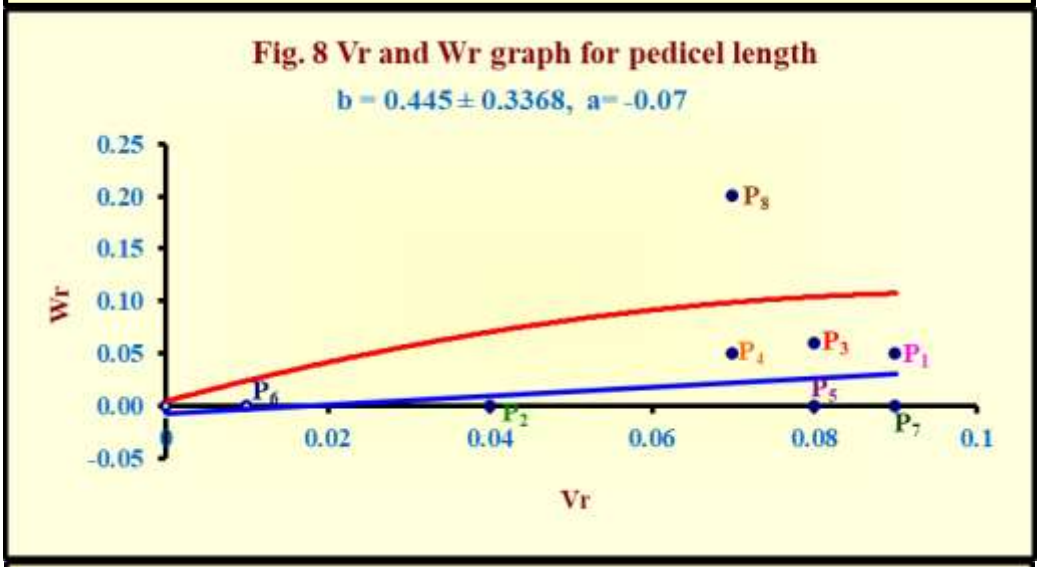

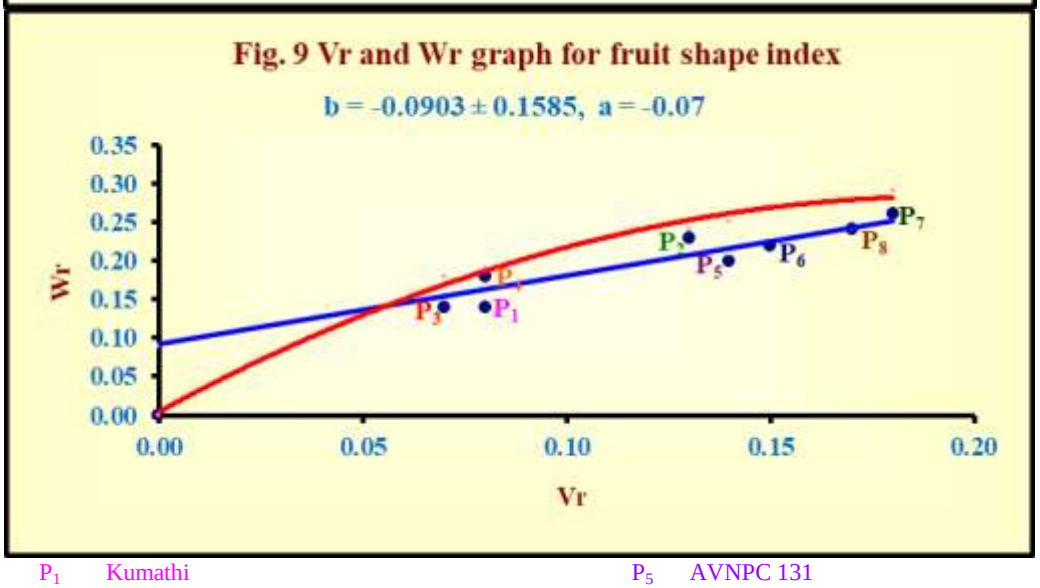

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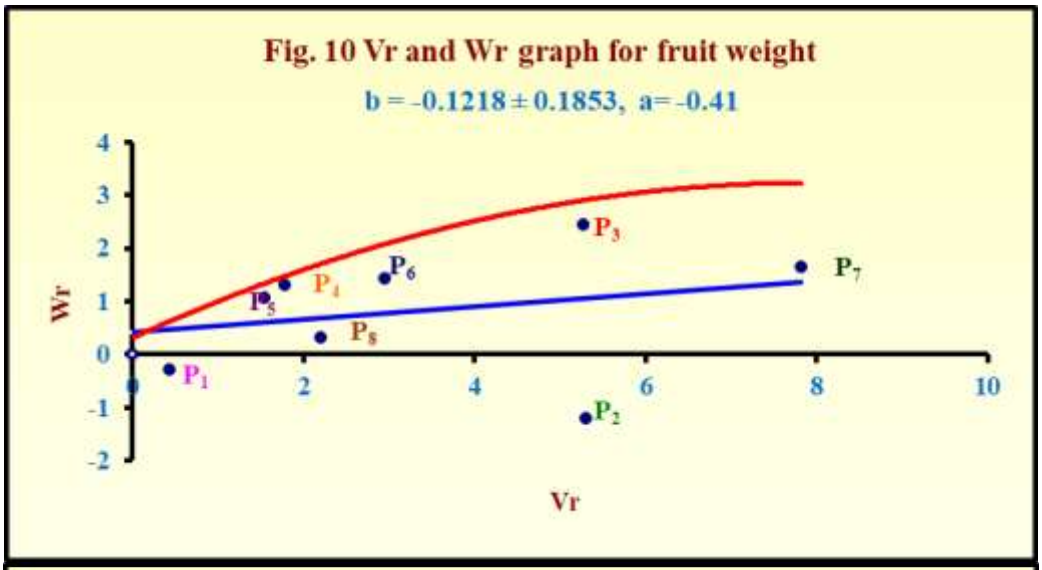

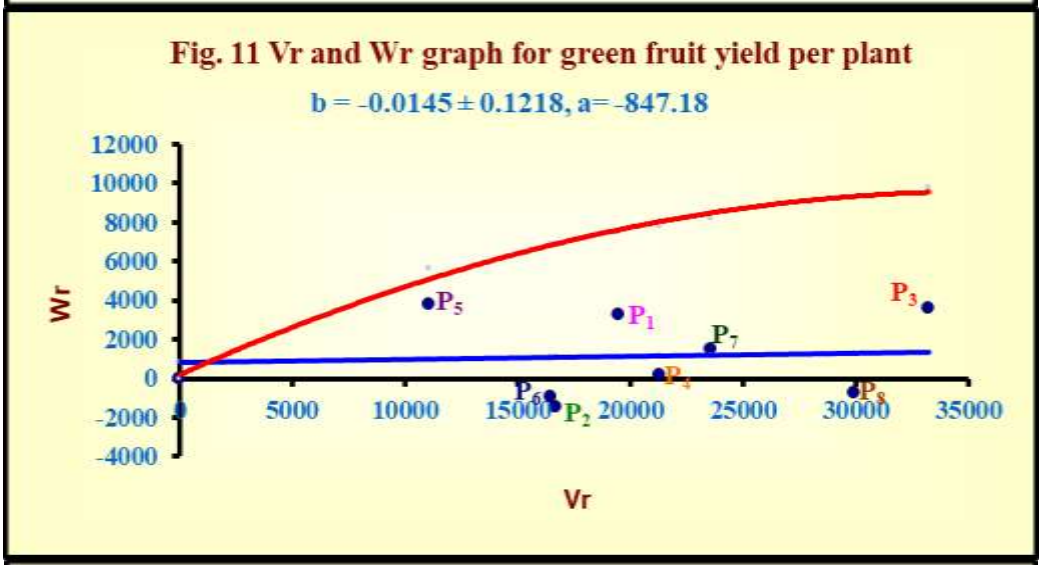

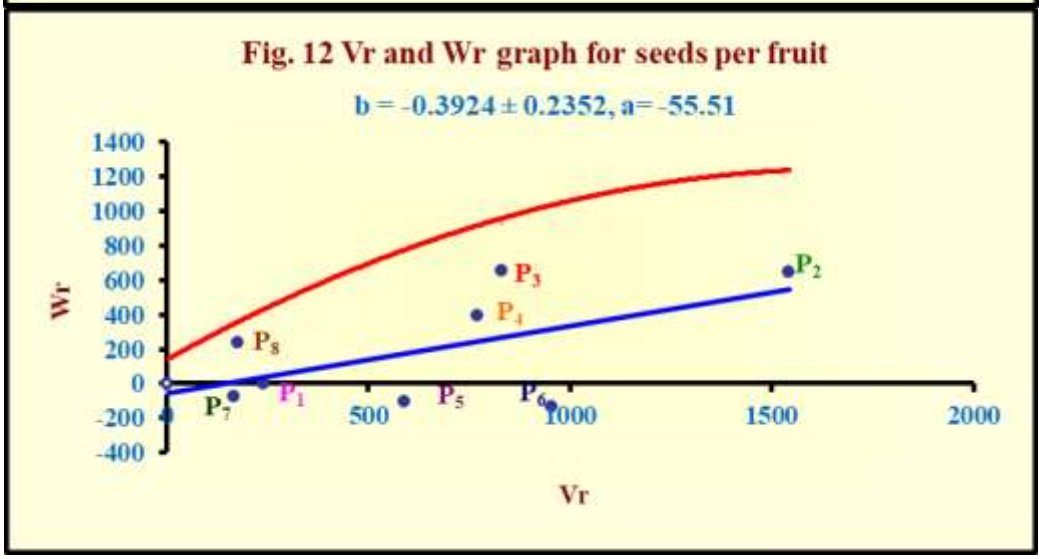

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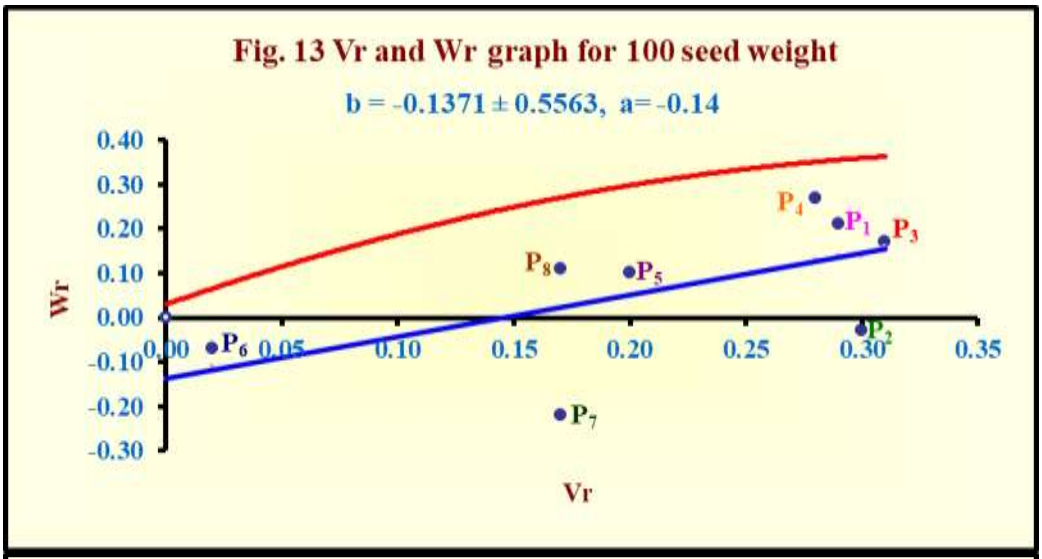

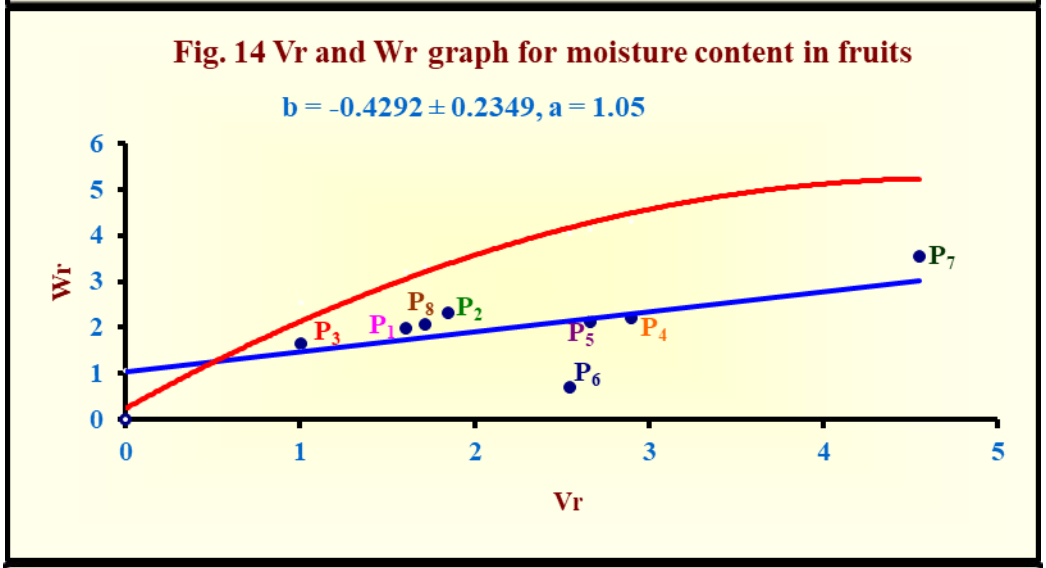

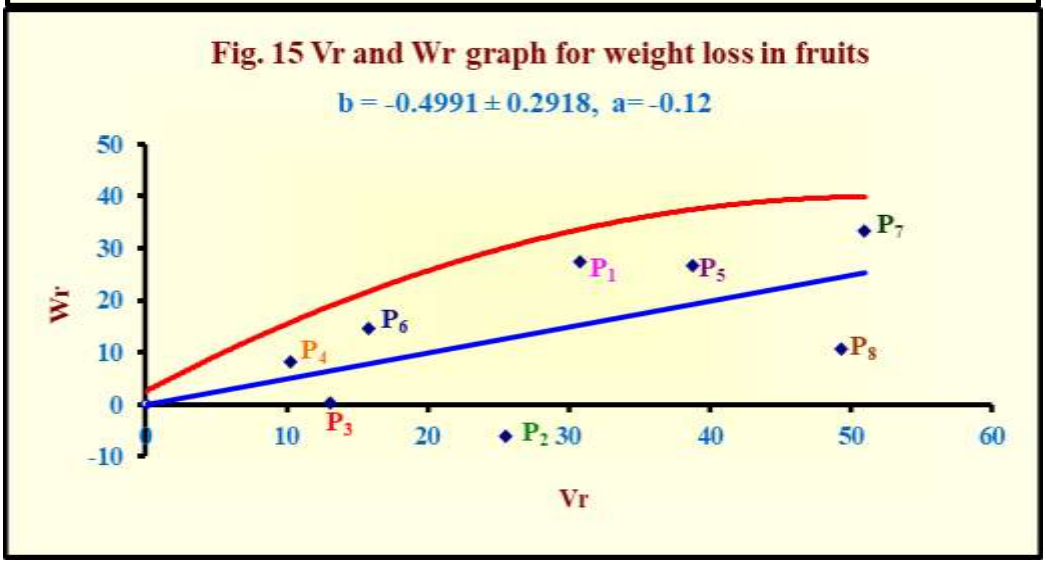

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