



International conference on SUSTAINABLE WATER USE FOR SECURING FOOD PRODUCTION IN THE MEDITERRANEAN REGION UNDER CHANGING CLIMATE

Evaluation of faba bean accessions under diverse water regimes

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Problematic

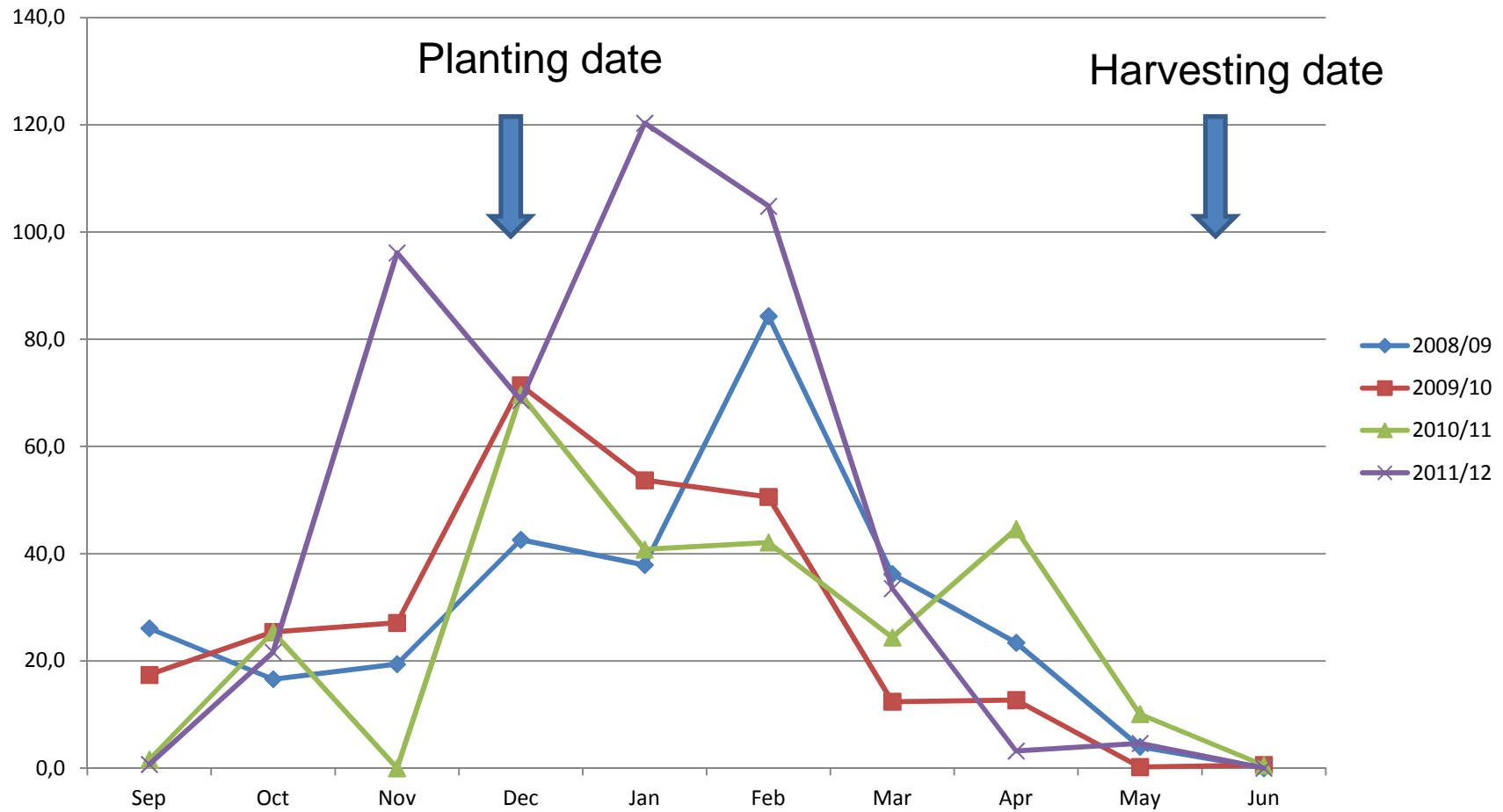
- Faba bean is very sensitive to drought than some other grain legumes (McDonald and Paulsen 1997; Amede and Schubert 2003).
- Terminal intermittent and terminal droughts are the major problems of the crop
 - Reduction of the grain yield
 - Reduction of seed quality



2 Purpose of this Research

- Evaluate the variation of faba bean genotypes under diverse water irrigation
- Effect of irrigation on faba bean Grain yield (GY) and biological yield (BY)
- Relationship between GY, BY and other collected traits

Meteorological Data in TH





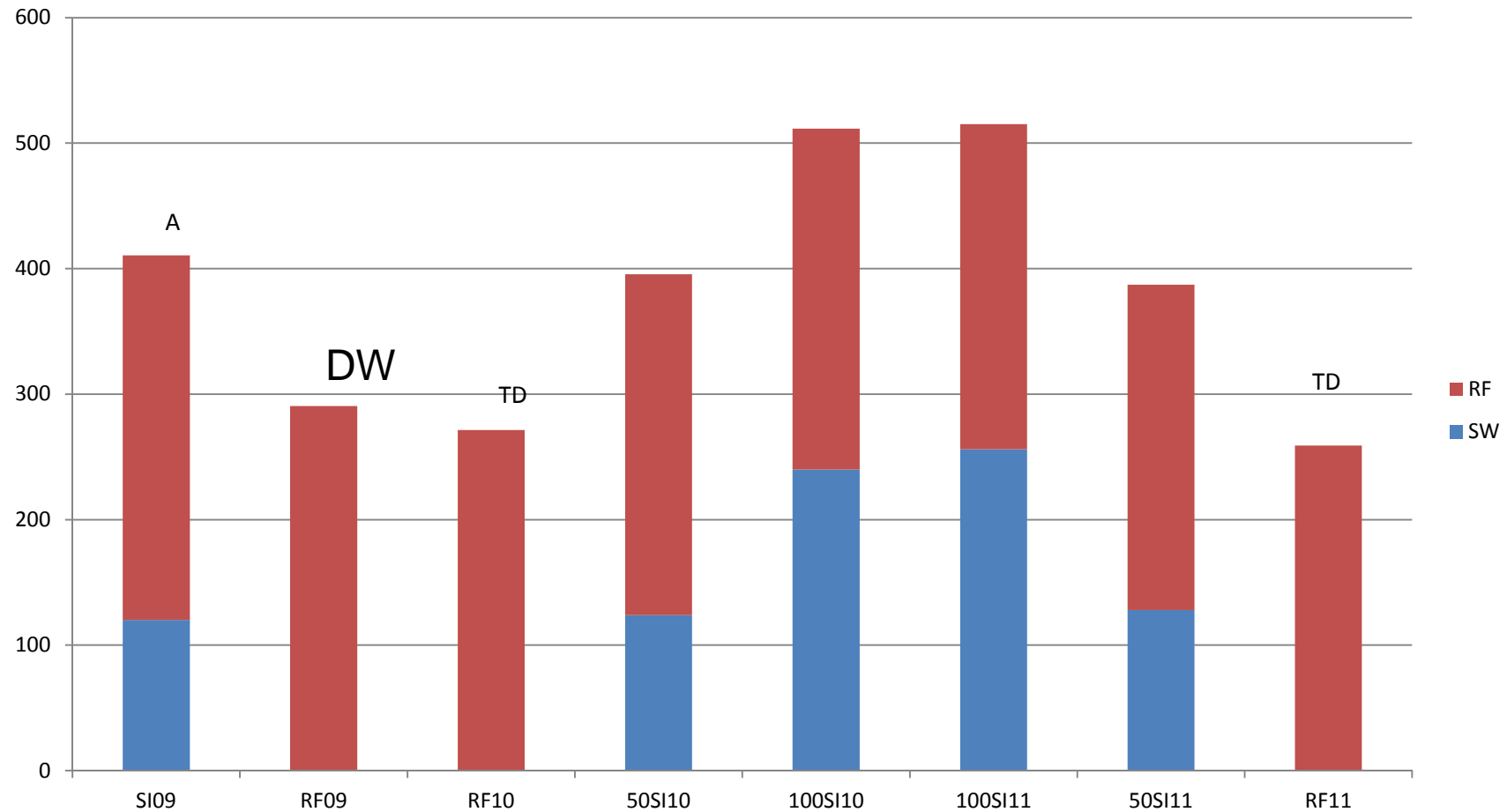
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Methodology

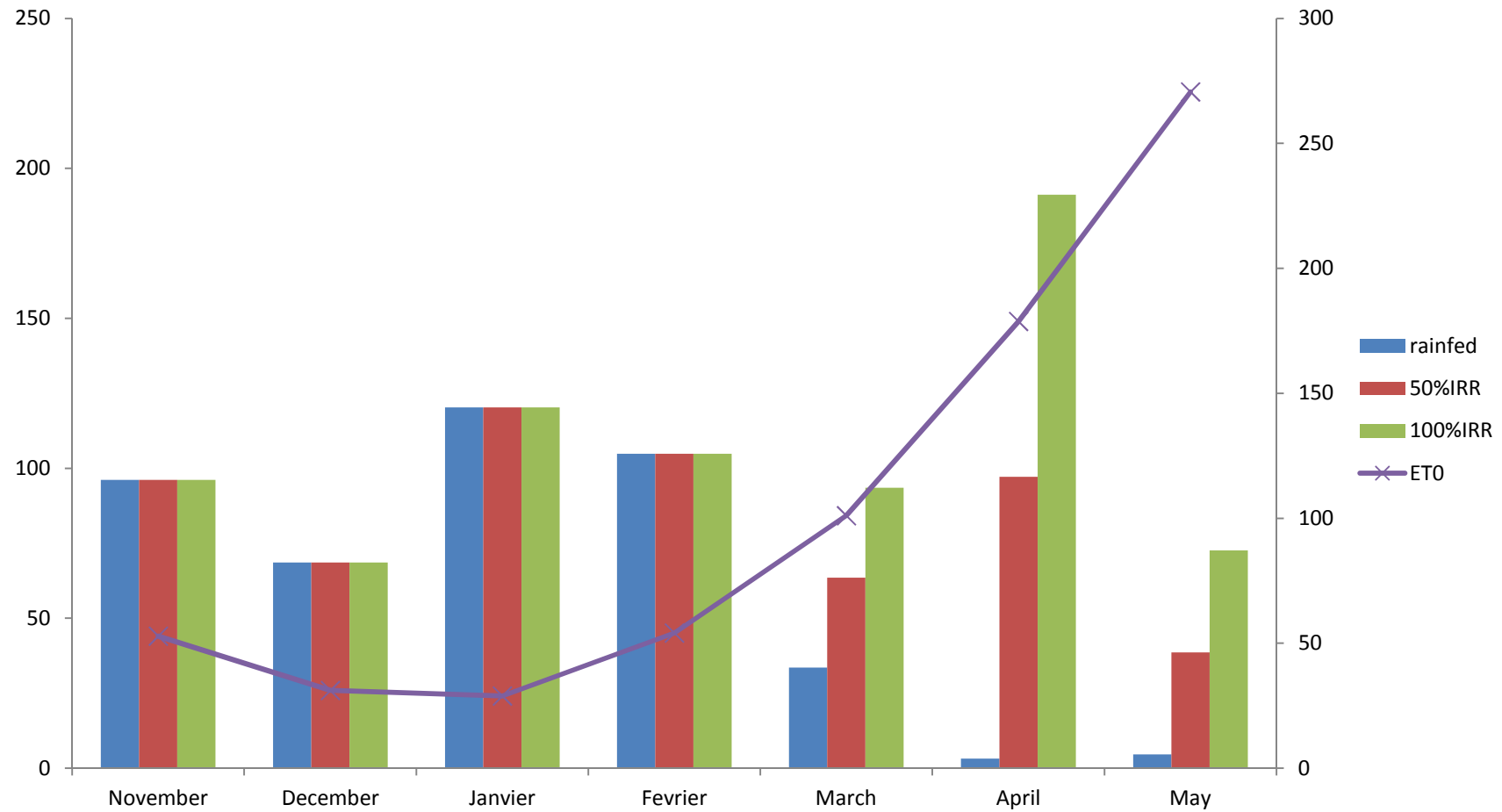
- 11 faba bean genotypes: 8 breeding lines and 3 cultivars
- Complete randomized block with 2 replication in 2009 and 3 rep in 2010-2011 with different water regimes row and column position
- 2012 Split plot design with irrigation treatment in main plot
- Three treatment (Rainfed, 50%IR and 100%IR)
- Neuron Tube were used to monitor the level of moisture



Details of the different trials conducted with different water regimes 2009-2011



Split plot design treatment (2012)





3

Results

Parameter measured

- DFLR: Days to 50% flowering
- DMAT: Days to 50% maturity
- PTHT Plant height in cm
- RD: Average root deep
- DTN: Average distance between nodes
- GY: Grain Yield t/ha (GY)
- BY: Biological Yield t/ha (BY).
- RHWP: Rhizobium fixation per genotype (RHWP).
- HI: harvest index as ratio of GY to BY.



Results

Statistical Analysis

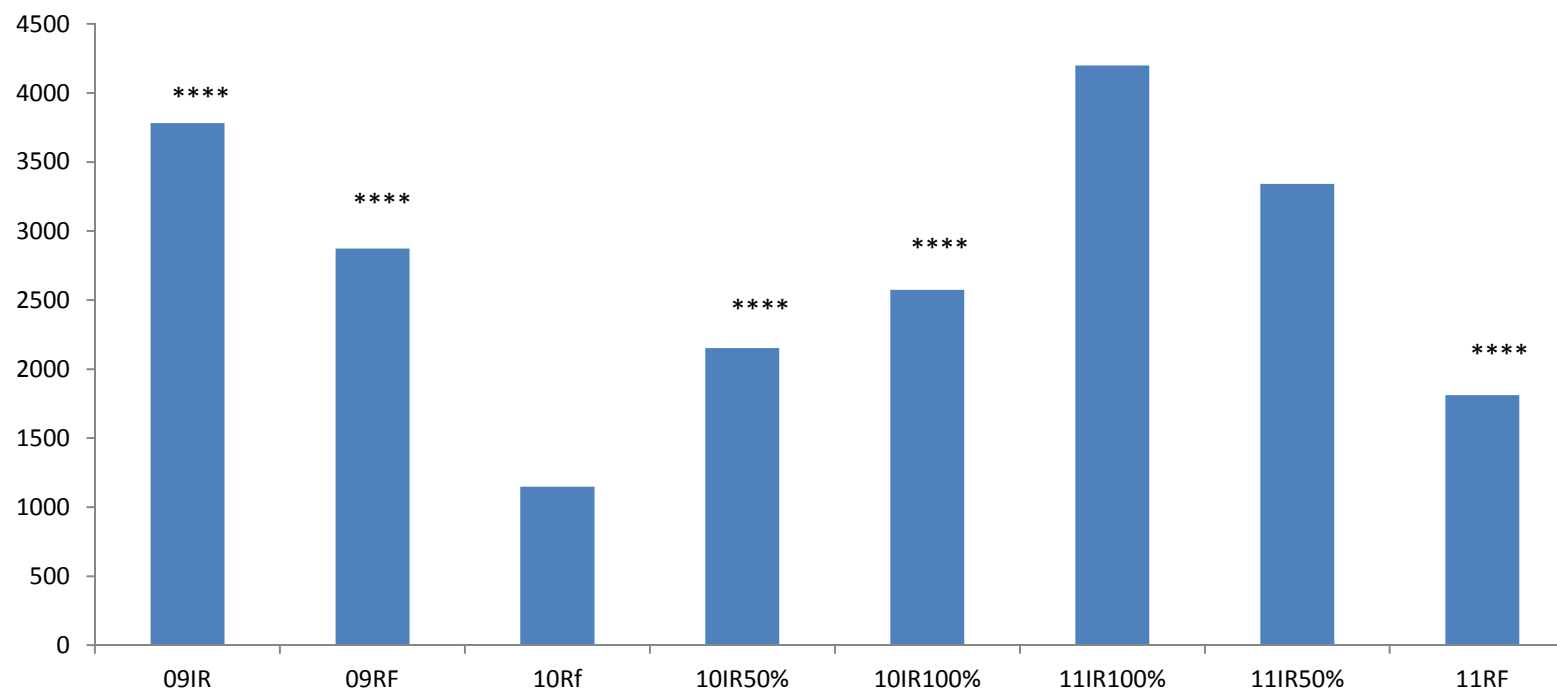
- spatial variability (Singh et al 2003).
 - Models accounted for the effects of complete blocks, linear trend and first order autocorrelation in the plot errors along rows and columns
- ANOVA analysis split plot trials using Genstat model
- Regression analysis between Grain Yield and other traits



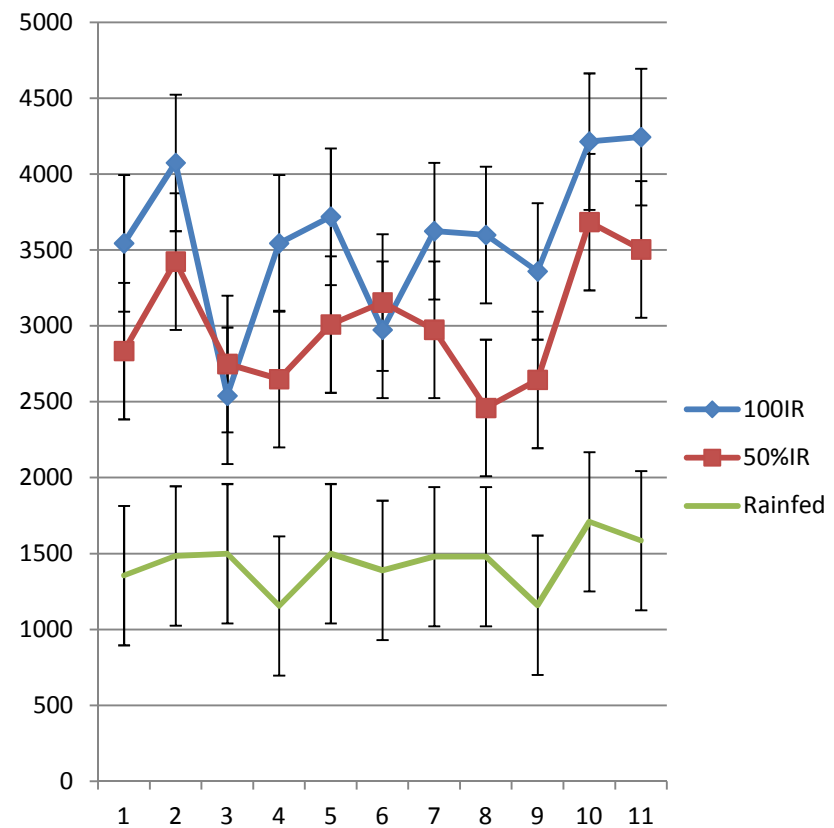
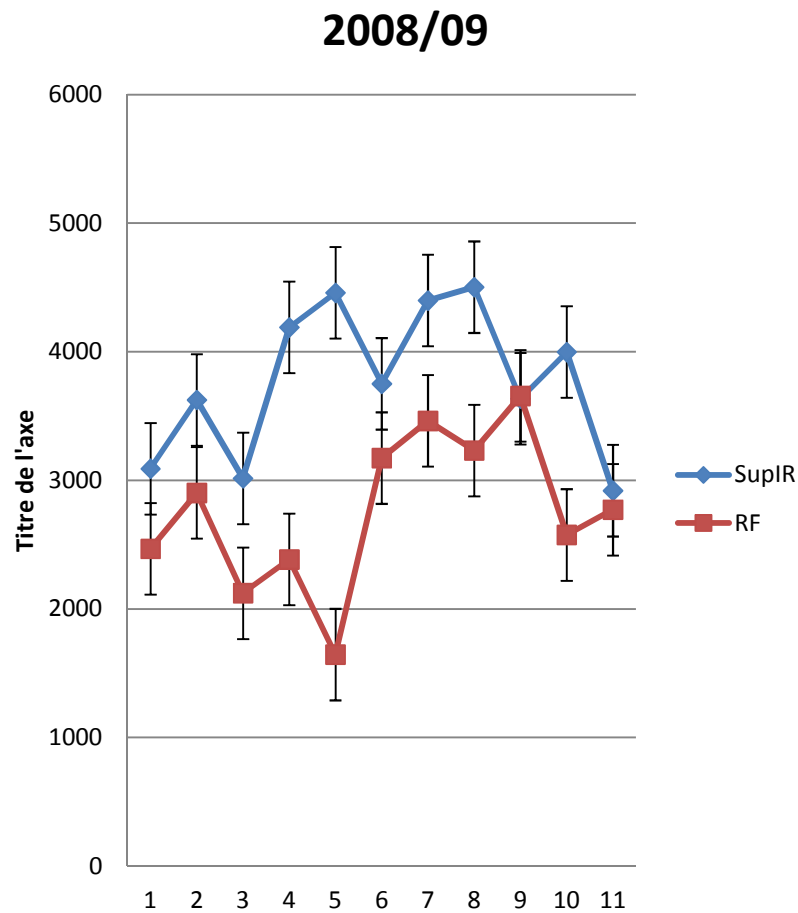
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Results

Genotypic variation and Grain Yield in different trials in TH

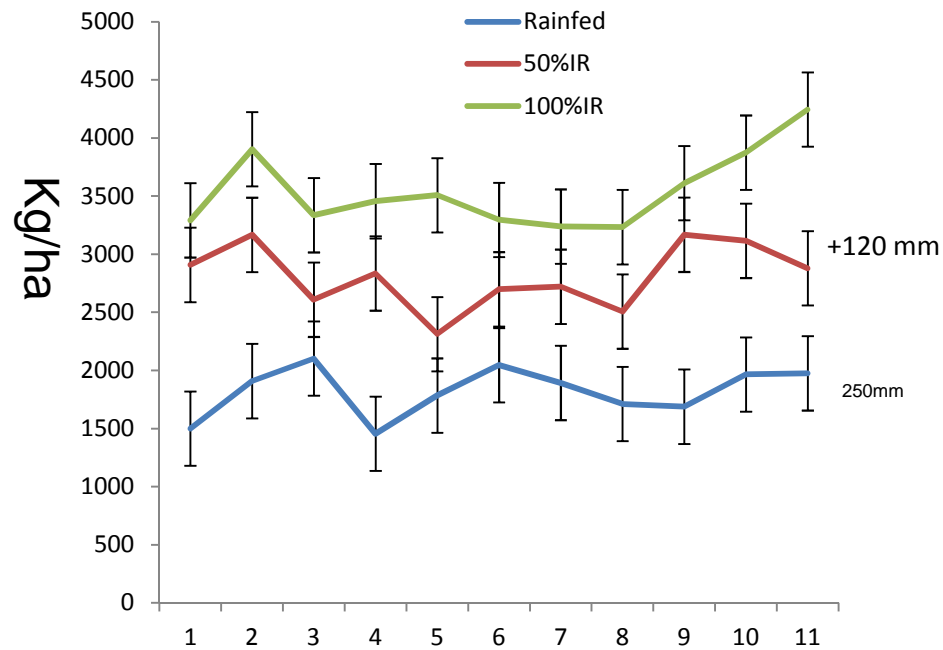


Performance of faba bean lines under different water regimes

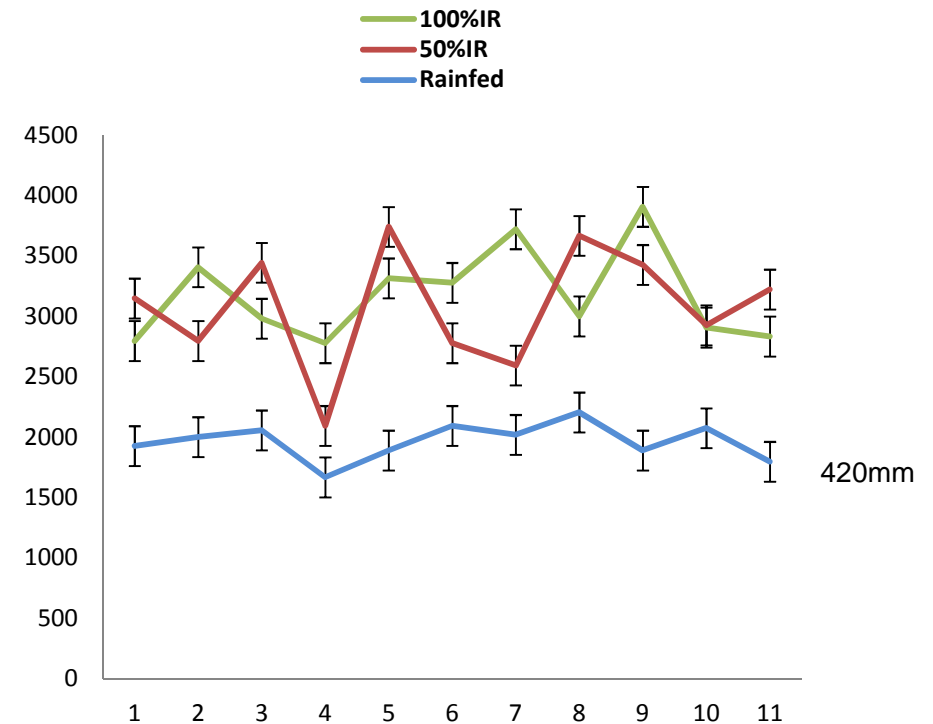


COMPARASION BETWEEN DIFFERENT GENOTYPES AND IRRIGATION LEVELS 2010-2012

2010/11 cropping season



2011/12 cropping season



Relationship between GY, BY and other traits

	Morphological traits*						
	DFLR	DMAT	DTN	PTHT	RDM	RHWP	HI
GY	0.809***	0.774***	0.162	0.4918**	0.2615	0.607**	0.611***
BY	0.619***	0.706***	0.310**	0.5875**	0.134	0.737***	0.093

Regression analysis

GY = -10403 (±738) + 37.53(±6.05)DFLR + 91.59(±8.61)DMAT - 825.1(±72.8)DTN; R² = 87.5% (DF = 84); P < 0.001

BY = -4494 (±1763) + 82(±14.9)DMAT - 483 (±156)DTN + 1104 (±201)RHWP; R² = 65.3% (DF = 84); P < 0.001

Stability analysis

Genotype	Mean (kg/ha)	Slope	SE(Slope)	P-value (slope=1)	R ² (%)	Deviation Mean Square	P-value (Deviation Mean Square)	CV (%)	Variance, Yau & Hamblin (1994)	Variance, Shukla (1992)
G1	2975	0.97	0.029	0.149	98.9	24097	0.959	49	0.00221	22679
G2	3218	1.02	0.030	0.253	98.9	26125	0.944	48	0.00573	23432
G3	3060	1.08	0.044	0.056	97.9	56701	0.469	53	0.00524	72452
G4	3003	1.04	0.043	0.165	97.9	53778	0.520	53	0.00552	58691
G5	3181	1.05	0.033	0.090	98.7	32782	0.873	50	0.00494	36025
G6	2903	0.81	0.050	0.001	95.2	74304	0.223	43	0.00648	174581
G7	3031	0.91	0.045	0.034	96.9	59581	0.422	46	0.00361	82407
G8	3051	0.99	0.048	0.427	97.0	68554	0.291	50	0.00703	70373
G9	3070	1.01	0.033	0.422	98.6	32843	0.872	50	0.00276	29979
G10	3214	1.07	0.043	0.057	98.0	54469	0.508	51	0.00571	69058
G11	3141	1.05	0.047	0.145	97.5	64537	0.346	51	0.00754	73059



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Conclusions and recommendations

- The developed faba bean drought tolerant lines performed under rainfed conditions homogenous water distribution during cropping season (300 to 400mm)
- In extreme drought with less than 250 mm, the yield dropped to 1.2 t/ha as average of all developed lines while traditional varieties went down less 1 ton/ha
- Days to maturity DMAT, days to flowering time (DFLR) and distance between nodes (DTN) explained 87.5% of the GY in dry land system, while DMAT, DTN and Rhizobium weight (RHWP) explained 65 % of Biological yield
- RHWP is mostly associated with on biological yield; and no relationship between RHWP and GY found.
- Faba bean lines genotypes responded positively to supplemental irrigation. It appears that 50% of irrigation of soil water capacity will be enough to increase the yield to maximum for some breeding lines
- The genotype G2 was the most stable and yielded genotype among all tested genotypes



**Thank you very much for
you attention**