and tuber yield indicated that the direct selection would be highly effective for the improvement of these traits. On the other hand, little improvement would be possible for tuber number per plant. Average tuber weight had significantly positive correlation with tuber yield. Non-significant correlation was observed between yield and late blight. Previous studies also advocated selection of average tuber weight for achieving higher yields in potato (Maris, 1988).

Average performance pooled over two years showed that only six accessions CP Nos. 2038, 2063, 2070, 2076, 2083 and 2173 yielded significantly higher than the best control Kufri Giriraj. All of these accessions were resistant to late blight and had acceptable tuber shape, eye depth and uniformity. Ten most promising accessions w.r.t. tuber yield and late blight are presented in Table 2. These accessions could be used as potential parents in late blight potato breeding programme. These accessions, however, need to be tested in large-scale multi-location trial to pickup a few best for commercial cultivation.

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Table 2. The most promising accessions (10) for tuber yield and late blight resistance

Tuber yield per plant				AUDPC (ascending order)			
CPRI accession No.	Donor's culture/ variety name	Source country	Value	CPRI accession No.	Donor's culture/ variety name	Source country	Value
CP 2063	B-71-240.2	Peru	362.94	CP 2038	Arran victory	Peru	19.30
CP 2173	MS 82.60	Peru	358.21	CP 3290	Hope Hely	Hungary	19.50
CP 2083	Pimpernel	Netherlands	354.47	CP 2076	2070 (4)	UK	24.75
CP 2070	DTO-33	Peru	343.37	CP 2015	Tollocan	Mexico	24.75
CP 2038	Arran victory	Peru	339.81	CP 3171	Bzura	Poland	26.17
CP 2076	2070 (4)	UK	335.96	CP 3191	25/40	Peru	28.50
CP 3360	TPS- 113	Peru	325.99	CP 2113	Mexiquense	Peru	33.00
CP 2015	Tollocan	Mexico	307.19	CP 2378	Poos .16	Peru	33.00
CP 3171	Bzura	Poland	305.92	CP 2063	B-71-240.2	Peru	34.50
CP 3366	TPS-13	Peru	287.61	CP 2305	Primicia inta	Peru	36.00
K. Jyoti	–	India	206.27	K. Jyoti	–	India	489.42
K. Giriraj	–	India	279.58	K. Giriraj	–	India	47.25
$CD_{0.05}$	48.85	$CD_{0.05}$	63.08				

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Evaluation of Exotic Potato Germplasm for Foliage Maturity and Flowering Characters under Field and Glass House Conditions

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Flowering behaviour of various genotypes is important to make the desired cross of any genetic and breeding work. It is essential that the parental genotypes flower over a sufficient length of time and that the flower

do not drop, but develop into fruits. The use of TPS for commercial cultivation of potato in some region (Gaur and Pandey, 1990), increases interest to the flowering and fruiting behavior of potato. Foliage maturity is important trait of commercial significance. However, evaluation of these traits under field conditions in North-western hills of India is difficult due to late blight disease and heavy rains prevalent in this region. If the crop is grown in glass house, crop can be protected from these problems. For the improvement of a trait, the knowledge of genetic parameters, viz. genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability and genetic advance are important. Information on the interrelationship among traits helps in formulating optimum selection procedure for their improvement. Little information is available in field vs. glasshouse performance for these traits in potato. Therefore, this study was undertaken to evaluate 121 potato genotypes under field as well as glass house conditions and to find out whether or not glass house test could be used as a substitute for field test.

A random sample of 121 accessions drawn from potato germplasm (*Solanun tuberosum*) available at Central Potato Research Institute, Shimla were grown at Central Potato Research Station, Kufri (Himachal Pradesh) during the summer season (April–September) of 2000-01 under field and glass house condition. Each accession had one row of five tubers each replicated two times in randomized block design. Observations on weeks to flowering, duration of flowering (in weeks), flowering intensity (1- shy, 2- moderate, 3-profuse) were recorded at weekly interval from flower initiation to end of flowering. Foliage maturity (time taken in weeks to 50% senescence) was recorded as (1-early: <13, 2-medium: 14-15, 3-late: 16-17 and 4-very late: >17). Pollen quantity (1-nil, 2-low, 3-medium, 4-abundant) and pollen fertility (% stainability in 1 % acetocarmine solution) were recorded on five flowers per accession in the flowering genotype at peak of flowering. Separate slide were prepared for each flower. The stained pollen was considered fertile and the unstained one as sterile. Data for both the conditions was analyzed using software SPAR1 (IASRI, New Delhi).

Significant genotypic differences were observed for all the characters studied under glass house as well as field conditions. Out of 121 genotypes, only 96 flowered in both the conditions. Sixty-three did not bear any berry under field and 71 under glass house condition. Thirty-two accessions were male sterile under field whereas 30 showed male sterility under glass house. Gopal (1994) had also reported enough variation for these characters under field conditions. Range, mean, PCV, GCV, heritability and genetic advance (as % of mean) for seven characters based on 96 flowering genotypes are presented in Table 1. Parameters of variability followed same trend under both the conditions. Variation was high for number of self berries/plant and pollen fertility, moderate for flowering duration, flowering intensity and pollen quantity and low for weeks to flowering. PCV for all characters were higher than their corresponding GCV. High heritability coupled with high genetic advance and high CV for number of self berries/ plant and pollen fertility suggested direct selection for the improvement of these traits. On the other hand, little improvement would be possible for weeks to flowering. These results are in agreement with earlier studies reported by Kumar and Gopal (2003).

Correlation coefficients between characters within condition and within character between conditions are presented in Table 2. Significant negative correlation

Table 1. Parameters of variability for foliage maturity and flowering traits in potato under field and glass house conditions

Characters	Range	Mean ± SE	PCV	GCV	Heritability (%)	Genetic advance	(% of mean)
Weeks to flowering	Field	7.00 – 9.00	7.97 ± 0.48	8.25	5.58	45.7	6.20
	Glasshouse	7.00 – 10.00	8.68 ± 0.56	9.00	6.25	48.3	7.20
Flowering duration (weeks)	Field	1.00 – 4.00	3.28 ± 0.86	47.712	39.82	69.6	22.40
	Glasshouse	1.00 – 7.00	3.31 ± 0.83	46.21	38.89	70.8	22.30
Foliage maturity (score)	Field	1.00 – 4.00	2.27 ± 0.49	39.50	33.05	70.00	13.00
	Glasshouse	1.00 – 4.00	2.26 ± 0.43	29.46	22.32	54.4	7.90
Number of self berries/ plant	Field	0.00 – 14.75	1.07 ± 1.12	140.18	210.49	76.8	40.60
	Glasshouse	0.00 – 12.40	0.74 ± 0.95	284.76	254.63	80.0	34.90
Pollen fertility (%)	Field	0.00 – 90.00	33.13 ± 9.80	92.76	87.92	89.8	56.88
	Glasshouse	0.00 – 95.00	32.45 ± 10.67	95.85	90.03	88.2	565.40
Flowering intensity (score)	Field	1.00 – 3.00	2.11 ± 0.43	29.77	21.61	52.7	6.80
	Glasshouse	1.00 – 3.00	2.15 ± 0.43	29.35	21.46	53.5	7.00
Pollen quantity (score)	Field	1.00 – 4.00	2.81 ± 0.37	36.74	34.37	87.5	18.60
	Glasshouse	1.00 – 4.00	2.86 ± 0.49	31.72	26.74	71.1	13.30

Table 2. Correlation co-efficients among flowering traits and foliage maturity in potato

Between characters within condition				Within character between conditions	
Characters		Field	Glass house	Characters	Field Vs glasshouse
Weeks to flowering	Vs. flowering duration	-0.232*	-0.280**	Weeks to flowering	0.330**
	Vs. foliage maturity	0.107	0.182	Flowering duration	0.524**
	Vs. No. of self berries/ plant	0.071	0.000	Foliage maturity	0.365**
	Vs. pollen fertility	-0.108	0.179	No. of self berries/ plant	0.623**
	Vs. flowering intensity	-03.91**	-0.222**	Pollen fertility	0.778**
	Vs. pollen quantity	0.024	0.068	Flowering intensity	0.705**
Flowering duration	Vs. foliage maturity	0.562**	0.543**	Pollen quantity	0.409**
	Vs. No. of self berries/ plant	0.321**	0.420**		
	Vs. pollen fertility	0.133	0.185		
	Vs. flowering intensity	0.545**	0.439**		
	Vs. pollen quantity	0.036	0.103		
Foliage maturity	Vs. No. of self berries/ plant	0.379**	0.358**		
	Vs. pollen fertility	0.192*	0.273**		
	Vs. flowering intensity	0.388**	0.193*		
	Vs. pollen quantity	0.152	0.215*		
No. of self berries/plant	Vs. pollen fertility	0.357**	0.303*		
	Vs. flowering intensity	0.153	0.148		
	Vs. pollen quantity	0.233**	0.239**		
Pollen fertility	Vs. flowering intensity	0.100	0.078		
	Vs. pollen quantity	0.662**	0.775**		
Flowering intensity	Vs. pollen quantity	-0.005	0.048		

* Significant at 5 % level; ** Significant at 1 % level

of weeks to flowering was observed with flowering duration and flowering intensity under both the conditions advocating that genotype flowering early, flowered for a short duration and had fewer flower per plant. Thus, simultaneous improvement would be difficult in these characters. Weeks to flowering had no association with foliage maturity indicating that foliage maturity can't be judged based on the initiation of flowering in genotypes. Flowering duration showed significantly positive correlation with foliage maturity, number of self berries/plant and flowering intensity indicating that genotype flowering for longer period had more number of berries flowered profusely and were late maturing. Significant positive correlations of number of berries per plant and flowering intensity with foliage maturity were also observed. Significant positive correlations were also observed between number of berries per plant and pollen fertility, number of berries per plant and pollen quantity and pollen fertility with pollen quantity.

Correlation coefficients between glasshouse and field study revealed significant positive correlations for all the characters though magnitude was low for weeks to flowering, foliage maturity and pollen quantity. This showed that potato genotypes can be screened for foliage maturity and flowering traits in glasshouse if field evaluation is problematic. Genetic parameters and correlations as observed in this study also indicated that potential exists for the simultaneous improvement of flowering intensity and flowering duration, but associated with an increase in maturity period.

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