

A new non-destructive rapid method to select strawberry lines rich in polyphenols

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Introduction

Fruit total phenolic content (TPC) and total antioxidant capacity (TAC) are usually assessed by destructive wet chemistry. Yet, for precise agriculture and newly breeding programs, more rapid and non-destructive methods are needed.

The aim of present work was to (i) evaluate soluble solids content (SSC), titratable acidity (TA), TPC and TAC on the fruits of selected strawberry lines, (ii) determine the changes of the epidermal polyphenols of leaves using Dualex at three berry maturity stages (green, pink and red), (iii) explore the correlation of Dualex readings on leaves vs. SSC, TA, TPC and TAC in order to establish the possibility of using Dualex to screen strawberry seedlings rich in polyphenols during vegetative growth stage (seedlings).

These results might open a new door for screening high nutritional value strawberry genotypes during seedling evaluation which will consequently shorten the period of field evaluation while reducing the time from crossing to naming.

Materials & methods

A field experiment was conducted to investigate the potential of Dualex, applied to fruit breeding, on four selected strawberry genotypes ('Kent', 'Jewel', 'Saint-Pierre' and 'SJ8976-1') of known quality.



Dualex measurements were taken on the lamina of the uppermost fully expanded leaves, avoiding midribs, three times during berry maturity, at green, pink and red stages.

SSC, TA, TPC and TAC were determined on fully red strawberry fruits.

GLM procedure of SAS was used to analyze the data. Means were separated using the least significant difference (LSD) tested at the 0.05 level, when the F value was significant. Pearson's correlation coefficients were also calculated.

Results & discussion

Our results showed that Dualex readings either from the adaxial side (upper side, DUAD), abaxial side (lower side, DUAB), sum of DUAD and DUAB (Phen), SSC, TA, TPC and TAC of 'Jewel' and 'Kent' were significantly higher than those of 'SJ8976-1' and 'Saint-Pierre'. There were positive correlations between Dualex readings vs. SSC, TA, TPC and TAC.

Table 1. Means of Dualex readings on leaves of selected strawberry lines during three stages of berry maturity

	Green-berry Stage			Pink-berry Stage			Red-berry Stage		
	DUAD	DUAB	Phen	DUAD	DUAB	Phen	DUAD	DUAB	Phen
Kent	1.25ab	0.39a	1.64a	1.83ab	0.71a	2.54ab	2.11a	0.93a	3.04a
Jewel	1.29a	0.51a	1.80a	1.90a	0.73a	2.63a	2.13a	0.93a	3.06a
Saint-Pierre	1.00c	0.30a	1.30a	1.45c	0.48b	1.94c	1.75b	0.67b	2.42b
SJ8976-1	1.02bc	0.35a	1.38a	1.60bc	0.51b	2.11bc	1.84b	0.73b	2.57b
LSD _{0.05}	0.24	0.18	0.40	0.26	0.19	0.43	0.23	0.19	0.29

Table 2. SSC, TA, TPC and TAC on fruits of selected strawberry lines measured at optimum maturity

	SSC (°Brix)	TA (%)	TPC (µg GAE g ⁻¹)	TAC (µg AAE g ⁻¹)
Kent	6.9a	0.81a	925.0a	2006.4a
Jewel	7.2a	0.88a	993.5a	2149.3a
Saint-Pierre	6.4b	0.71b	802.8b	1681.2b
SJ8976-1	6.5b	0.70b	805.7b	1752.8b
LSD _{0.05}	0.3	0.07	119.2	215.8

Note: All values are means of 5 replicates. LSD_{0.05}: Least significant difference at 0.05 level. TPC expressed as mg gallic acid equivalent (GAE) per gram fresh-frozen weight. TAC expressed as mg ascorbic acid equivalent (AAE) per gram fresh-frozen weight.

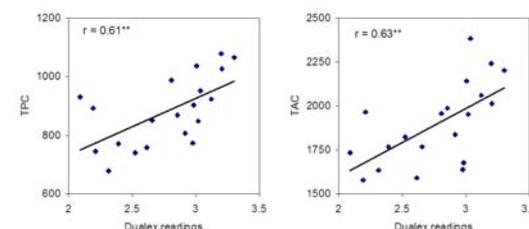
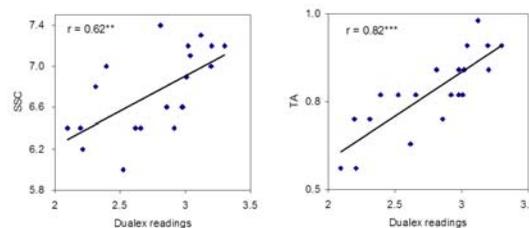


Fig. 1. Correlation between Dualex readings and SSC, TA, TPC and TAC at fully red maturity stage

Note: *, **, *** indicate significant difference at 0.05, 0.01, 0.001, respectively and NS indicates no significant difference.

Conclusions

Development of new strawberry lines with specific levels of TAC stimulates greater interest in the nutraceutical and functional food industry. Based on our results, a positive correlation between Dualex readings on leaves (vegetative growth) and fruit quality is observed. It appears that Dualex readings of leaf epidermis can be used to predict fruit quality during seedling evaluations to accelerate the selection process and reduce overall costs associated with seedling field evaluation. It worths being investigated further as a practical way of selecting seedling in a breeding program.

References

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