VALIDATION

Cabomba qPCR detection kit

SYL164

Document date: 13 November 2026



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molecular ecology

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1. *In silico* validation

Table 1. *In silico* validation of primers and probe

Parameter	Forward primer	Reverse primer	Probe*
Length (bp)	20	20	38
GC %	40	35	31
Stability	1.6	2.0	-
T_m (°C)	56	59	70
Target region	Mat K (chloroplast DNA)	Mat K (chloroplast DNA)	Mat K (chloroplast DNA)
Dimer formation	No	No	No
Nucleotide runs	No	No	No

*Probe labelled with FAM.

Table 2. *In silico* validation primers and probe combination

PCR product size (bp)	154
Combined dimer formation	No
***In silico* PCR on Genbank**	*Cabomba aquatic, Cabomba furcate, Cabomba caroliniana,*
Date of in silico PCR	May 2022

Conclusion:

The *in silico* analysis identified the target species exclusively, with no predicted amplification of non-target taxa.

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2. Experimental validation

All validation experiments were conducted using the Sylphium qPCR mix and analyzed with the Bio-Rad CFX96 Touch Real-Time PCR Detection System.

2.1. Analytical sensitivity, fluorescence output signal and efficiency

Standard solutions containing nominal target concentrations of 10^6, 10^5, 10^4, 10^3, 10^2, 10, and 0 target copies per reaction were analyzed at the optimal primer and probe concentrations. Fluorescence output was compared with the background signal, with a minimum 100-fold increase in fluorescence considered acceptable. Reaction conditions were optimized when fluorescence signals were insufficiently distinguishable from background noise.

The amplification efficiency of the primer and probe set was calculated from the slope of the standard curve and was considered acceptable when between 90% and 110%.

Results

Positive amplification was observed down to the lowest tested nominal concentration of **1-10 target copies per reaction**, demonstrating single-copy detection capability under the tested conditions (**Figure 1; Table 3**). The fluorescence output of positive reactions exceeded the predefined criterion of a 100-fold increase relative to the background signal.

The amplification efficiency of the assay was **90.9%**, indicating that the primer and probe set performed within the predefined acceptable efficiency range of 90-110% (**Figure 2; Table 4**).

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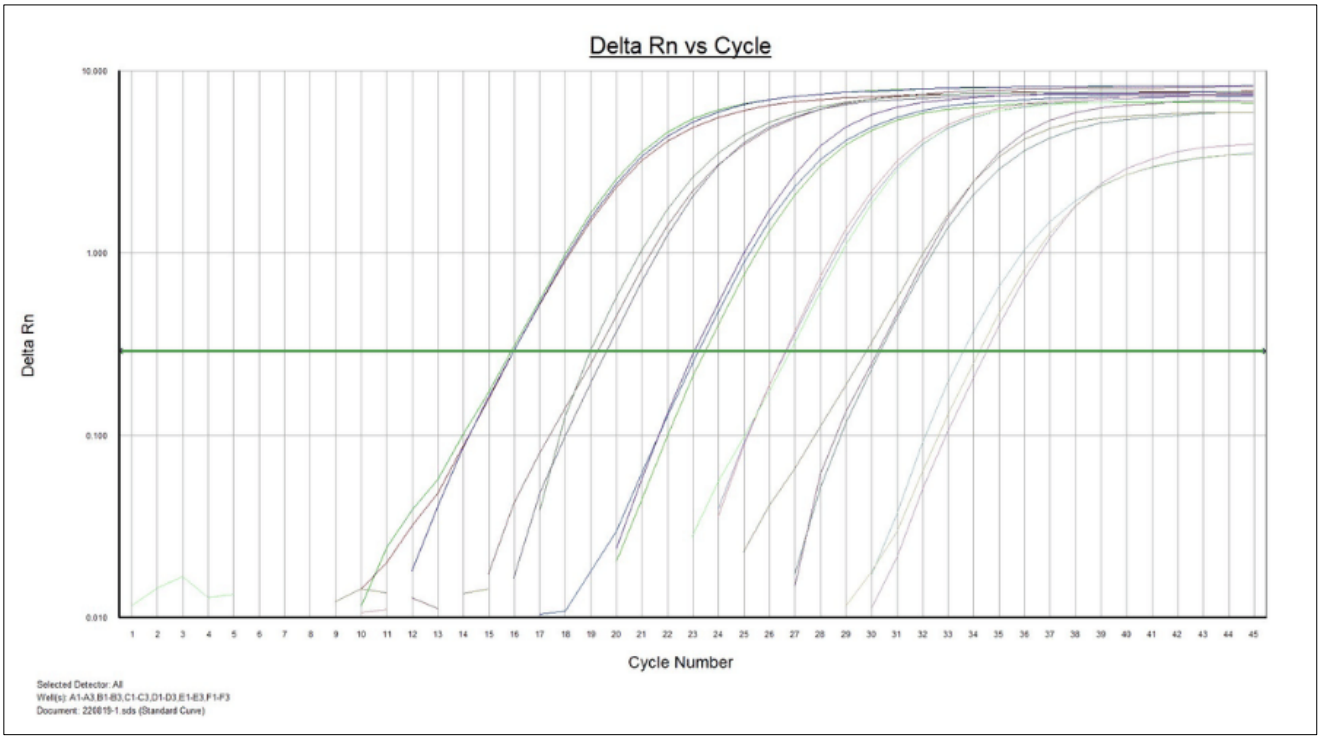


Figure 1. Amplification curves obtained at the optimal primer and probe concentrations and an annealing temperature of 60°C.

Table 3. Detection results and Cq values obtained at the optimal primer and probe concentrations and an annealing temperature of 60°C

Nominal target copies per reaction	Target detected	Mean Cq	SD
0	No	-	-
10	Yes	36.7	1.1
10^2	Yes	30.1	0.3
10^3	Yes	26.7	0.1
10^4	Yes	23.2	0.2
10^5	Yes	19.3	0.3
10^6	Yes	16.0	0.1

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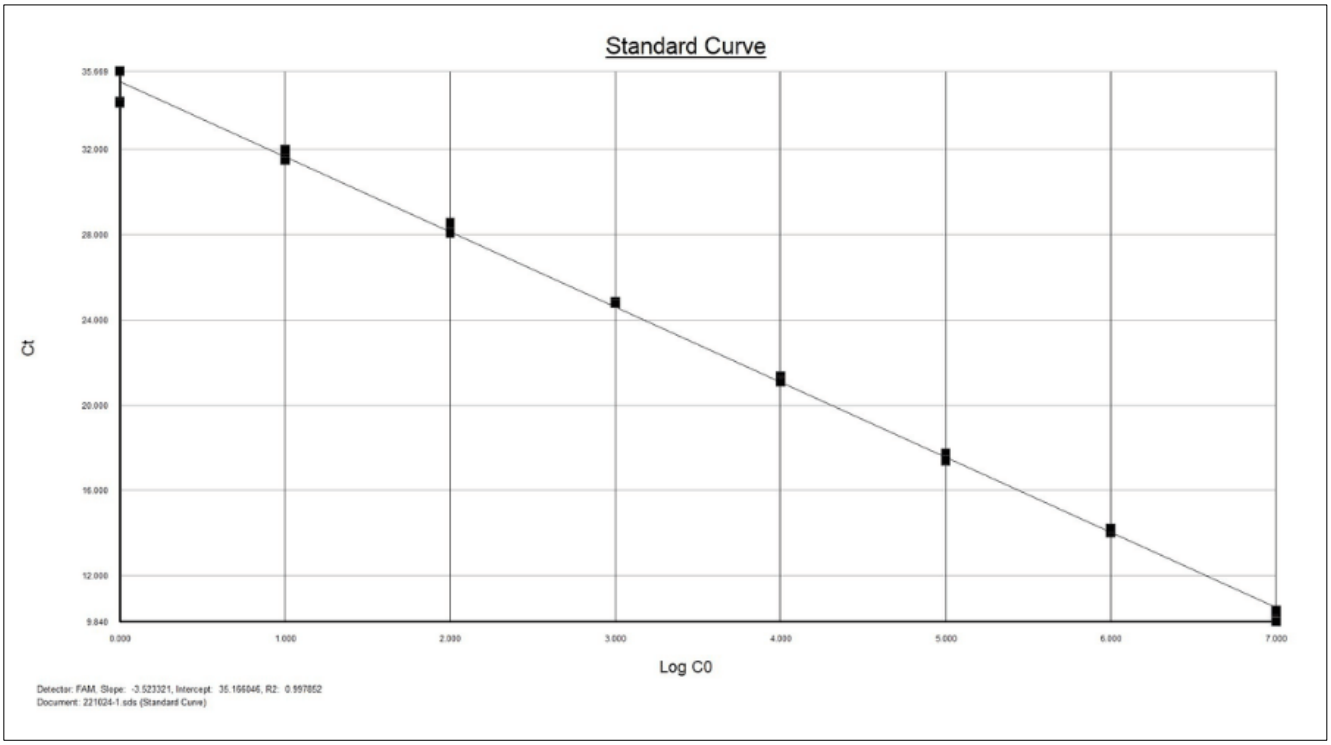


Figure 2. Standard curve generated from nominal target concentrations of 10, 10^2, 10^3, 10^4, 10^5, and 10^6 copies per reaction.

Table 4. Standard curve parameters obtained with the *Cabomba* qPCR detection kit

Parameter	Result
Slope	-3.56
Amplification efficiency (%)	90.9
R^2	0.998

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