Gamma algorithms report

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Centro de Investigación en Ciencia e Ingeniería de los Materiales

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University of Costa Rica

Specimen Information:

The following collections were used: ANGSOL BIOUCR CICIMAUCR INBUCR
Number of specimens per species:

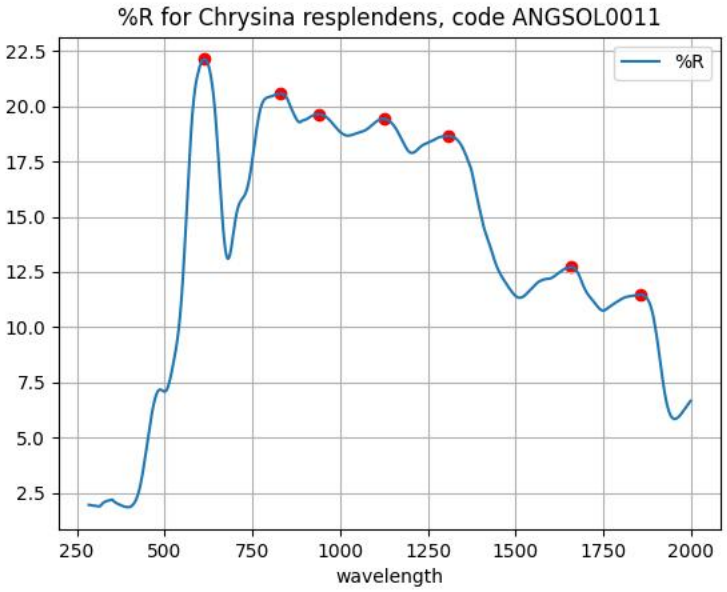
cupreomarginata	resplendens	kalinini
10	19	5

Relevant data:

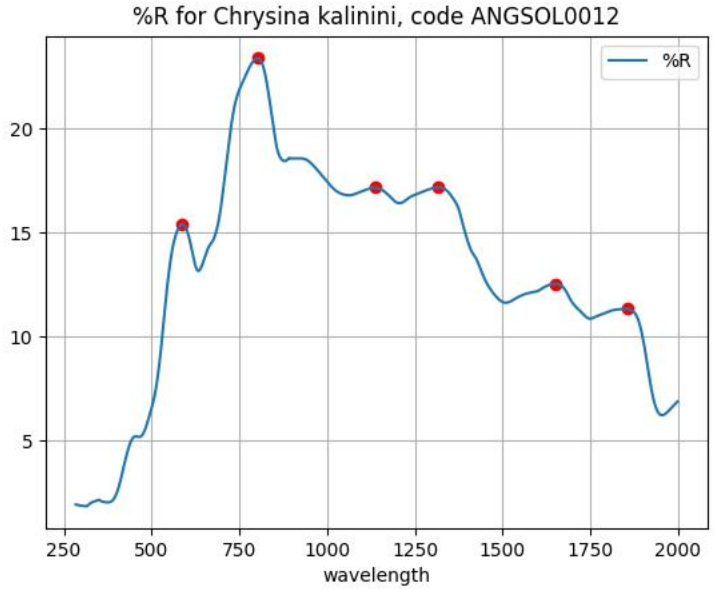
code	genus	species	measuring_mode
ANGSOL0011	Chrysina	resplendens	%R
ANGSOL0012	Chrysina	kalinini	%R
ANGSOL0017	Chrysina	kalinini	%R
ANGSOL0013	Chrysina	cupreomarginata	%R
CICIMAUCR0001	Chrysina	kalinini	%R
CICIMAUCR0006	Chrysina	kalinini	%R
CICIMAUCR0158	Chrysina	cupreomarginata	%R
CICIMAUCR0105	Chrysina	kalinini	%R
CICIMAUCR0104	Chrysina	resplendens	%R
INBUCR0433	Chrysina	cupreomarginata	%R
INBUCR0426	Chrysina	resplendens	%R
BIOUCR0007	Chrysina	cupreomarginata	%R
BIOUCR0019	Chrysina	resplendens	%R
BIOUCR0015	Chrysina	resplendens	%R
BIOUCR0028	Chrysina	resplendens	%R
BIOUCR0001	Chrysina	cupreomarginata	%R
BIOUCR0021	Chrysina	resplendens	%R
BIOUCR0002	Chrysina	cupreomarginata	%R
BIOUCR0020	Chrysina	resplendens	%R
BIOUCR0016	Chrysina	resplendens	%R
BIOUCR0003	Chrysina	cupreomarginata	%R
BIOUCR0018	Chrysina	resplendens	%R
BIOUCR0023	Chrysina	resplendens	%R
BIOUCR0004	Chrysina	cupreomarginata	%R

BIOUCR0026	Chrysina	resplendens	%R
BIOUCR0014	Chrysina	resplendens	%R
BIOUCR0005	Chrysina	cupreomarginata	%R
BIOUCR0024	Chrysina	resplendens	%R
BIOUCR0025	Chrysina	resplendens	%R
BIOUCR0029	Chrysina	resplendens	%R
BIOUCR0006	Chrysina	cupreomarginata	%R
BIOUCR0022	Chrysina	resplendens	%R
BIOUCR0017	Chrysina	resplendens	%R
BIOUCR0027	Chrysina	resplendens	%R

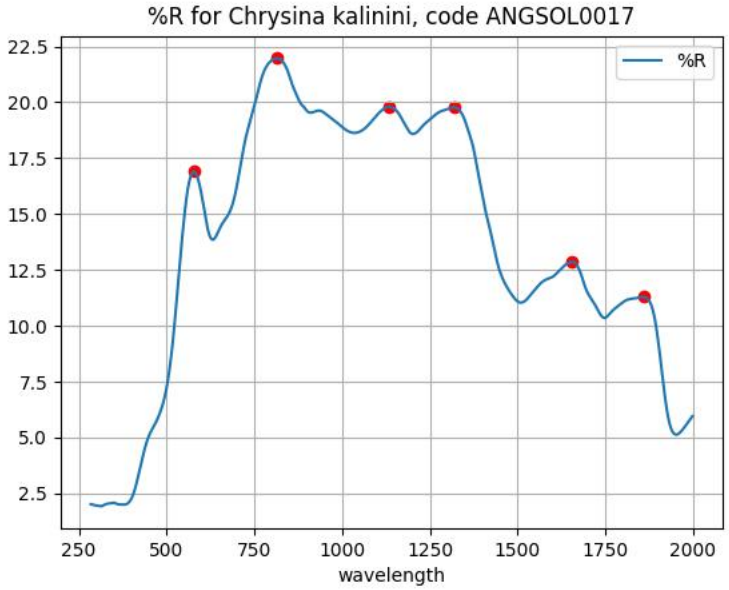
Spectral information :



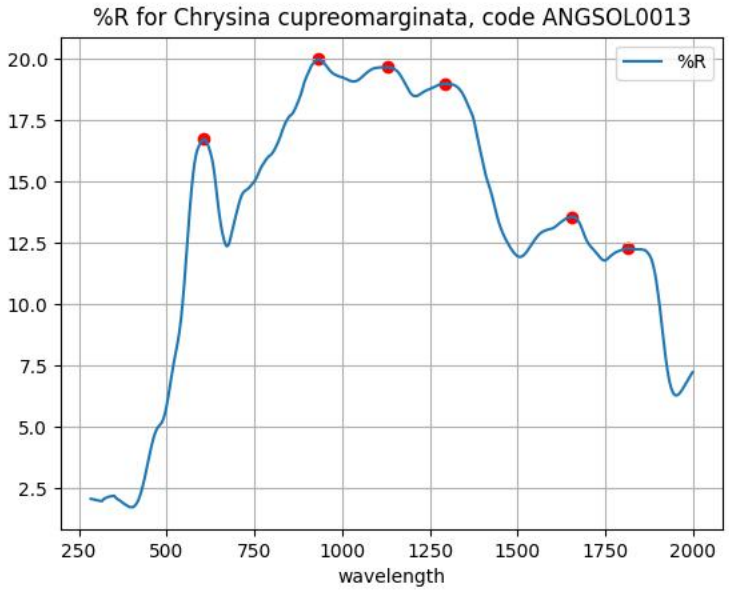
Peaks: [(614.0, 22.141436), (830.0, 20.584042), (939.0, 19.645468), (1126.0, 19.439115), (1308.0, 18.652939), (1659.0, 12.732522), (1855.0, 11.474259)]



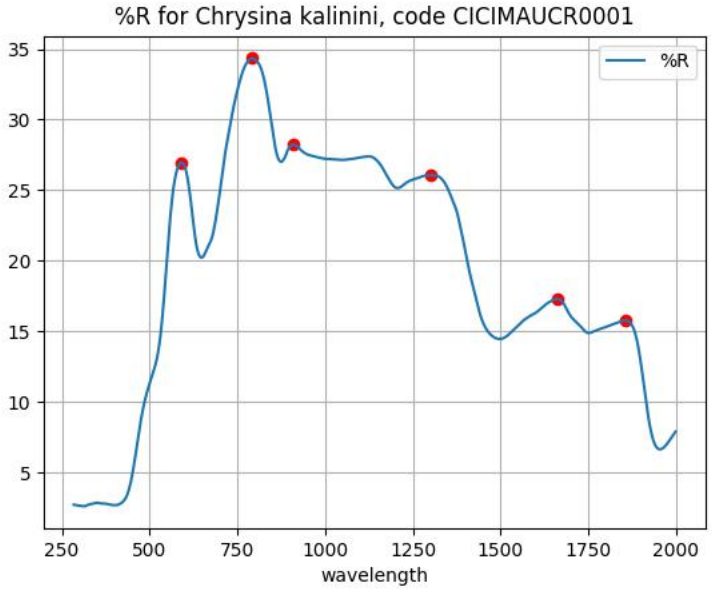
Peaks: [(587.0, 15.418853), (802.0, 23.39934), (1136.0, 17.175746), (1316.0, 17.186133), (1653.0, 12.540254), (1855.0, 11.352454)]



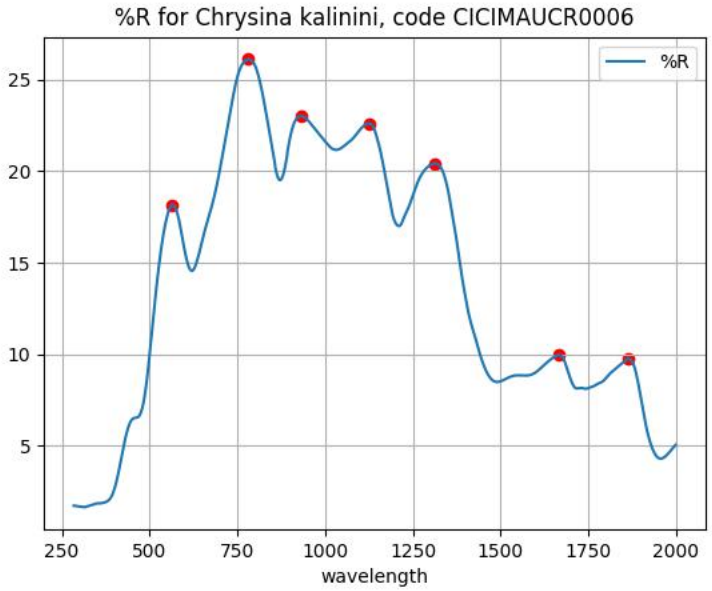
Peaks: [(578.0, 16.897974), (815.0, 21.972186), (1134.0, 19.797771), (1319.0, 19.773814), (1656.0, 12.855343), (1862.0, 11.288465)]



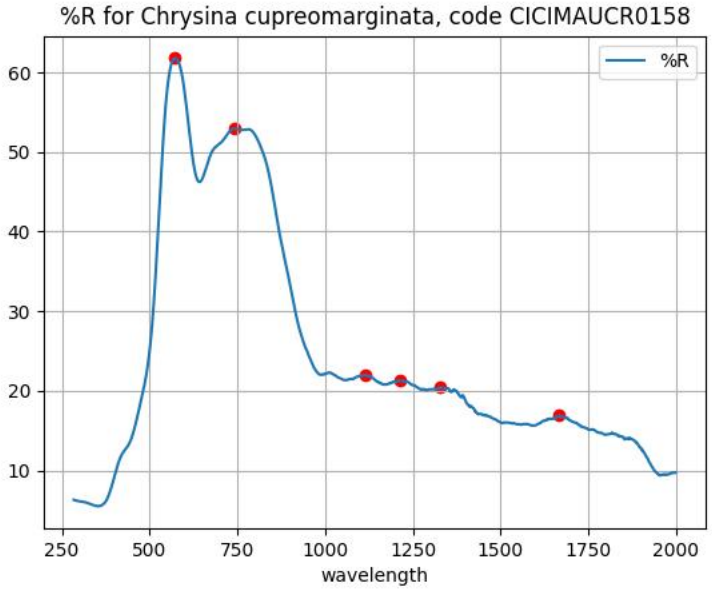
Peaks: [(607.0, 16.734231), (934.0, 19.997805), (1130.0, 19.674065), (1292.0, 18.994933), (1656.0, 13.574952), (1816.0, 12.279134)]



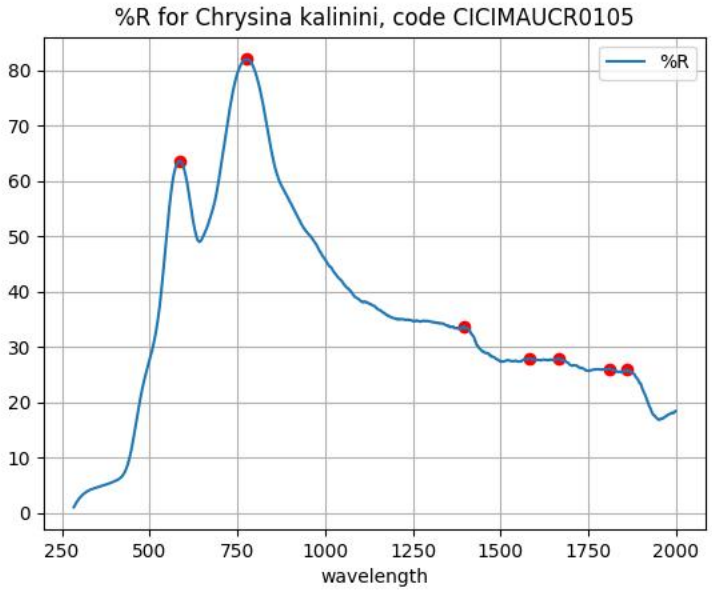
Peaks: [(591.0, 26.959362), (793.0, 34.350964), (910.0, 28.235531), (1303.0, 26.06338), (1662.0, 17.2852), (1856.0, 15.76056)]



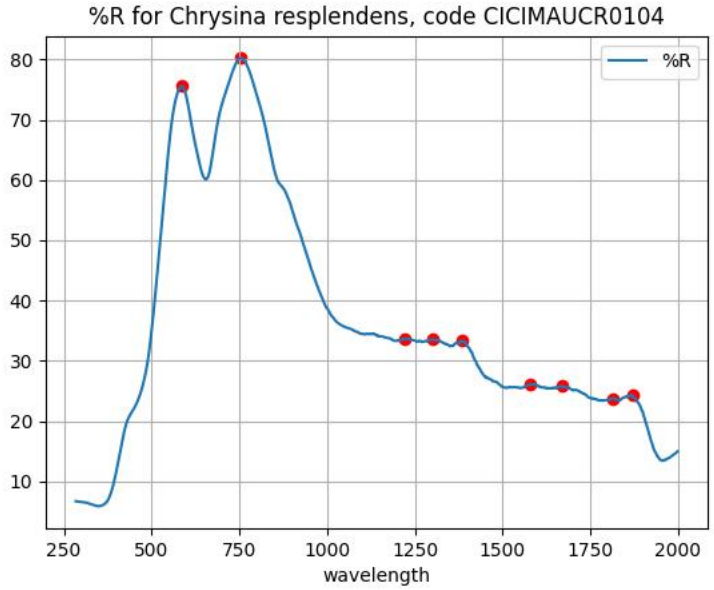
Peaks: [(565.0, 18.163598), (782.0, 26.107894), (932.0, 23.011311), (1126.0, 22.599803), (1314.0, 20.423529), (1668.0, 9.970063), (1865.0, 9.74714)]



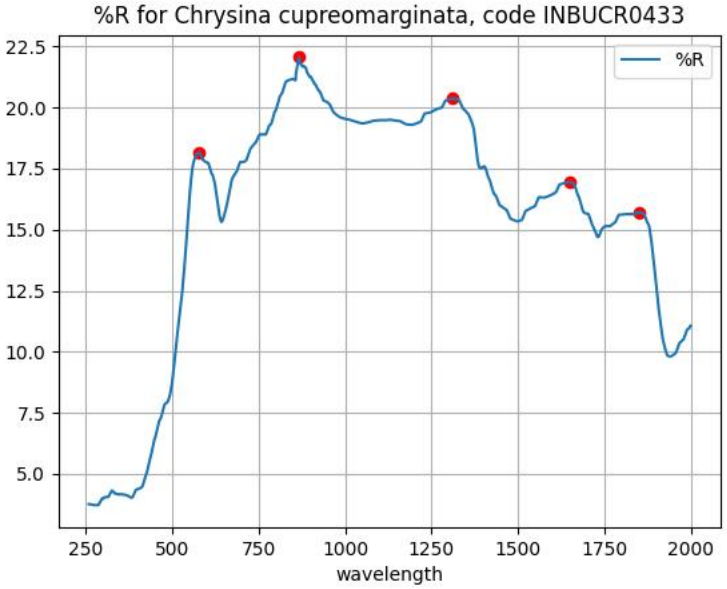
Peaks: [(572.0, 61.776244), (742.0, 52.898355), (1113.0, 21.963665), (1213.0, 21.272537), (1327.0, 20.413633), (1668.0, 16.892888)]



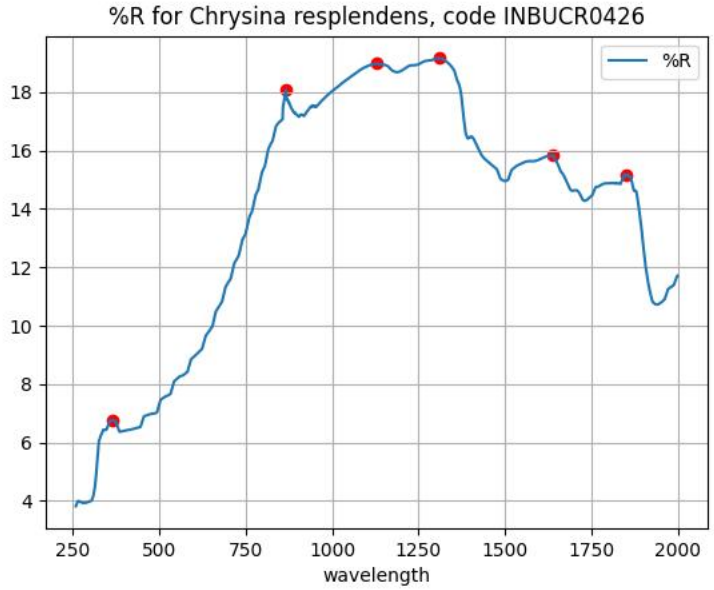
Peaks: [(586.0, 63.605839), (776.0, 82.017313), (1396.0, 33.658805), (1581.0, 27.869618), (1668.0, 27.925045), (1810.0, 25.998567), (1862.0, 25.869028)]



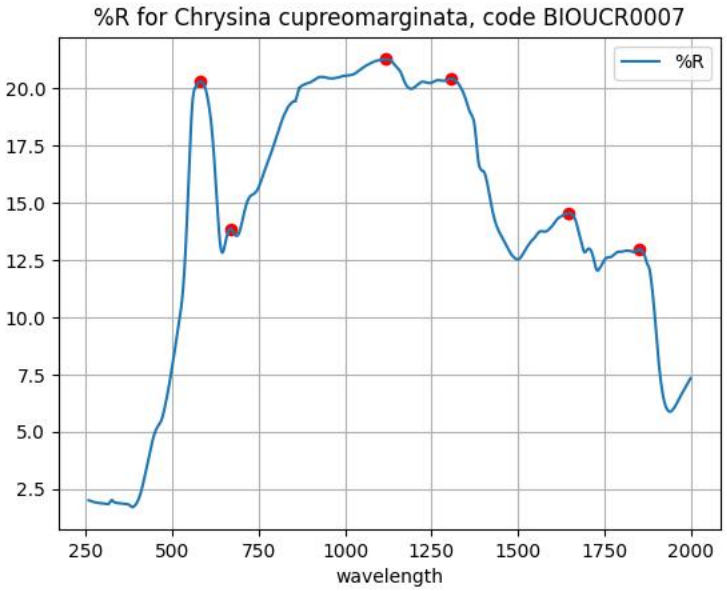
Peaks: [(586.0, 75.594599), (755.0, 80.225793), (1222.0, 33.67777), (1301.0, 33.514324), (1385.0, 33.293938), (1580.0, 26.147665), (1669.0, 25.831554), (1815.0, 23.739744), (1870.0, 24.295394)]



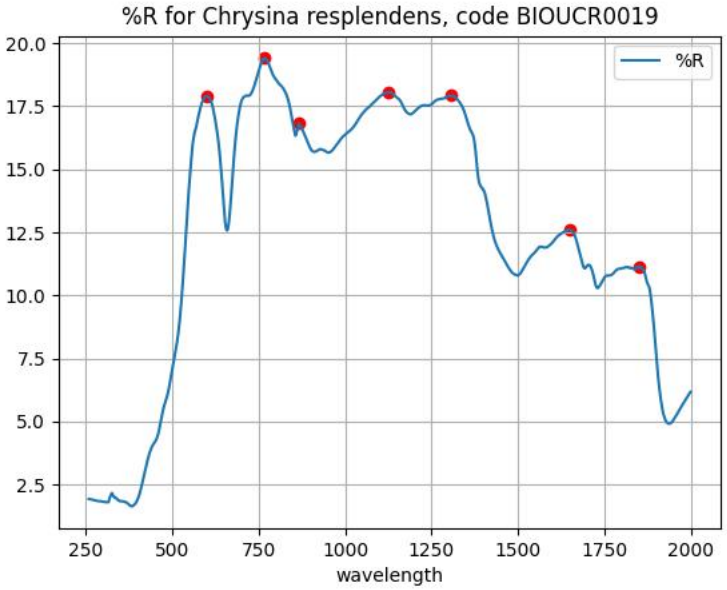
Peaks: [(579.0, 18.157826), (867.0, 22.058561), (1312.0, 20.363195), (1649.0, 16.939835), (1849.0, 15.719505)]



Peaks: [(366.0, 6.758911), (867.0, 18.076165), (1130.0, 18.986973), (1309.0, 19.163968), (1640.0, 15.83011), (1850.0, 15.180038)]



Peaks: [(582.0, 20.285717), (668.0, 13.865437), (1119.0, 21.264433), (1306.0, 20.405647), (1648.0, 14.536447), (1851.0, 12.974263)]



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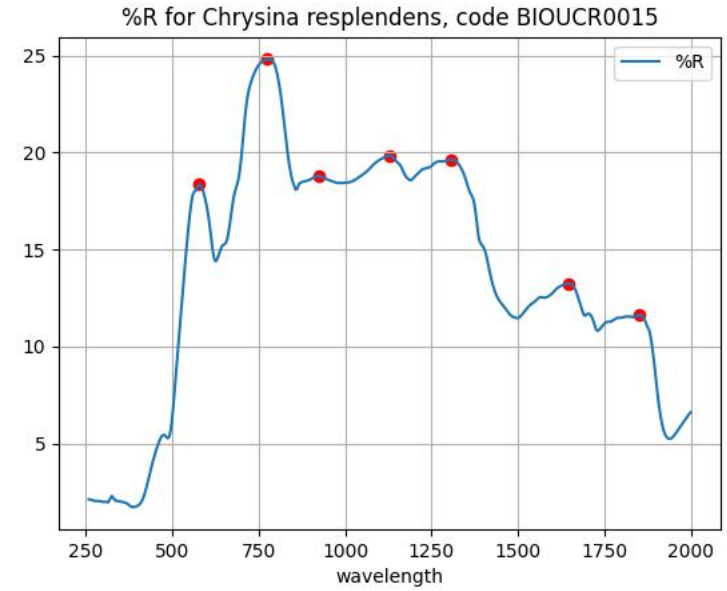

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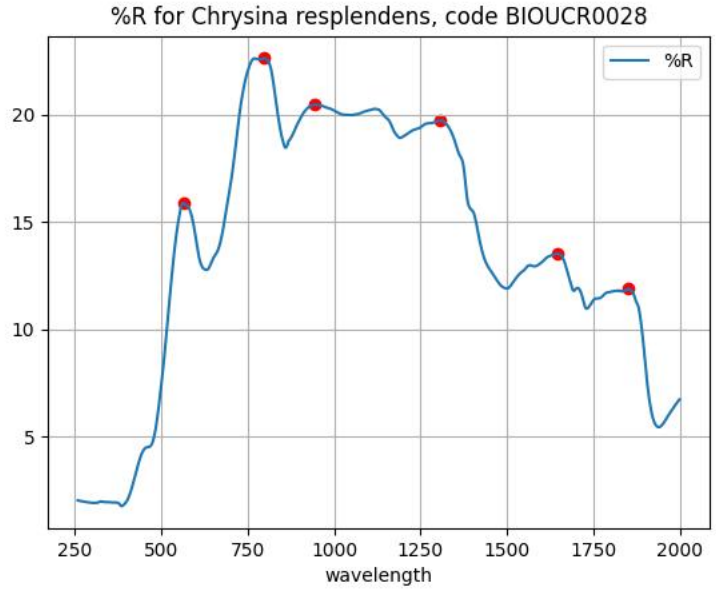
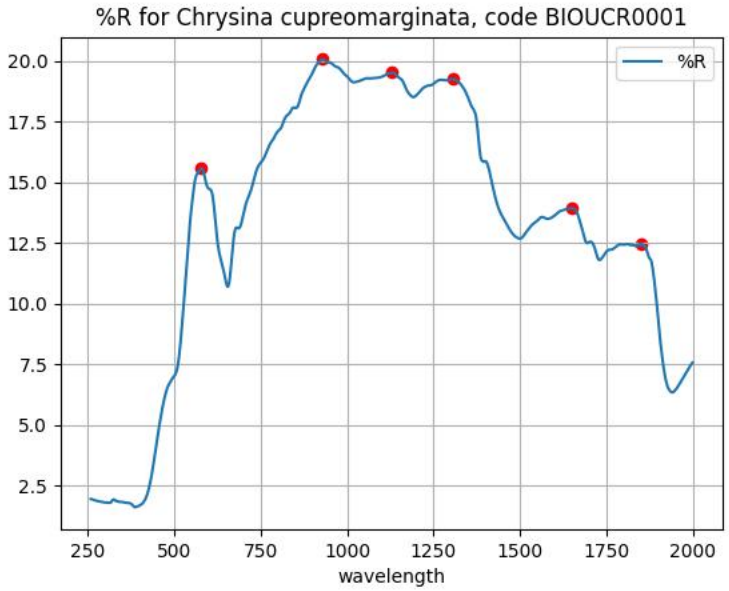


Peaks: [(564.0, 15.875091), (799.0, 22.623086), (943.0, 20.457403), (1308.0, 19.72017), (1646.0, 13.515927), (1851.0, 11.89156)]



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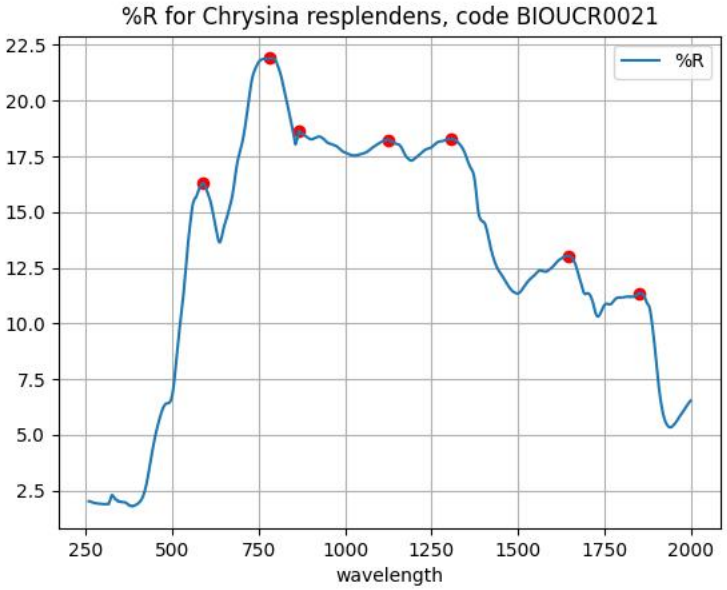

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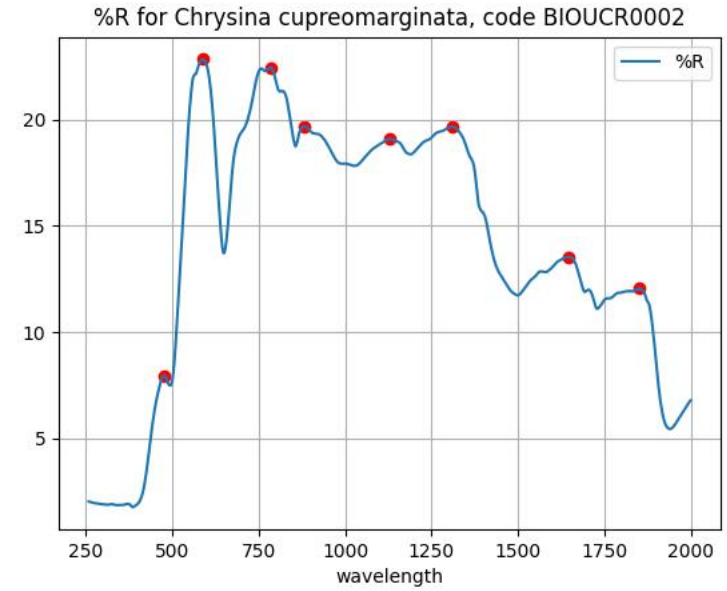

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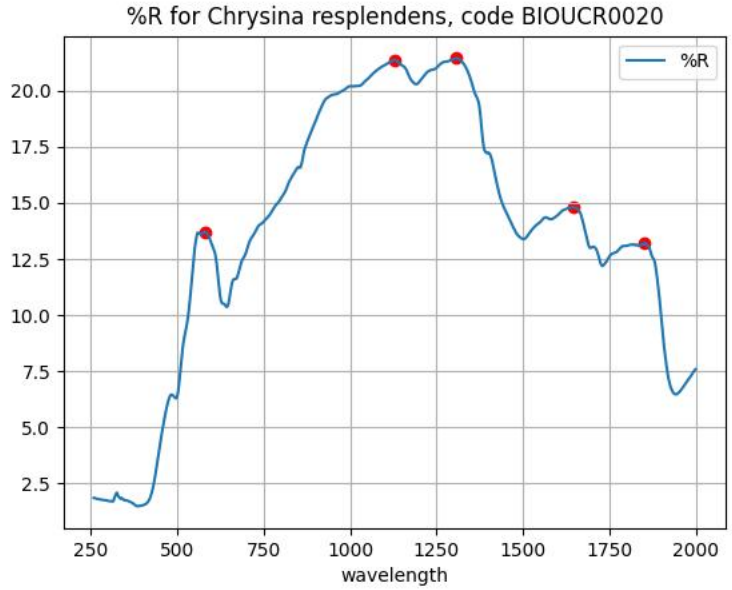

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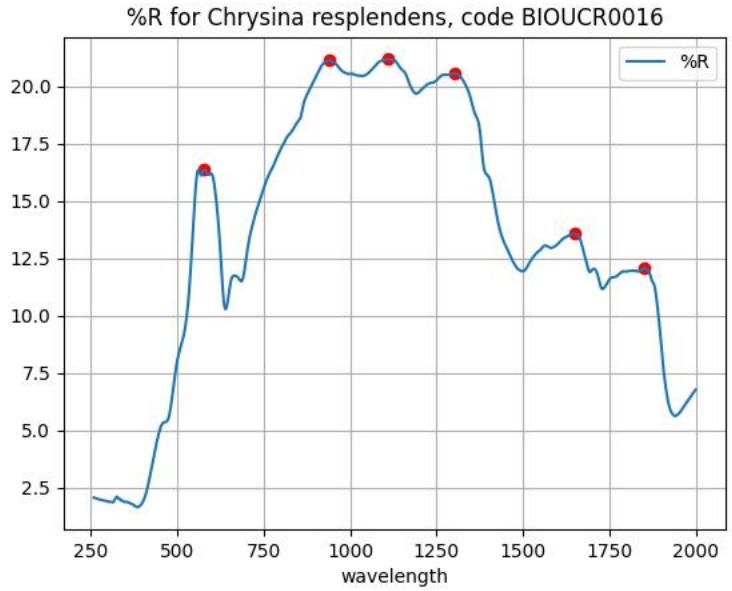

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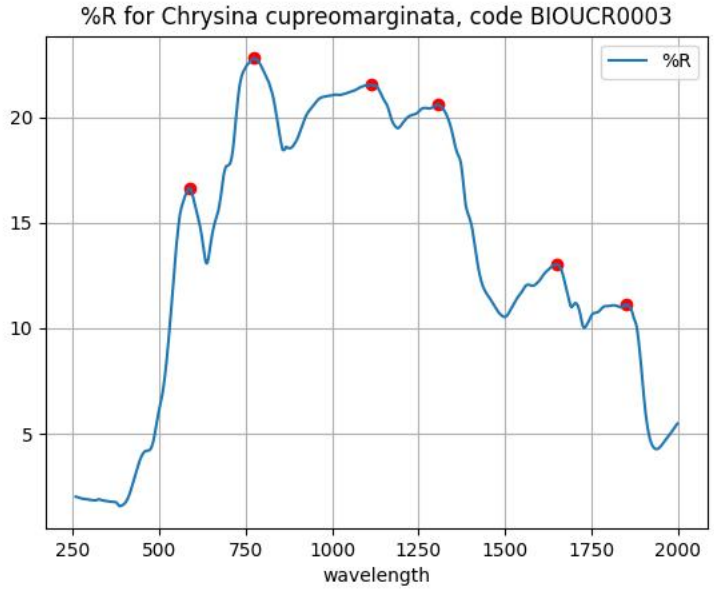

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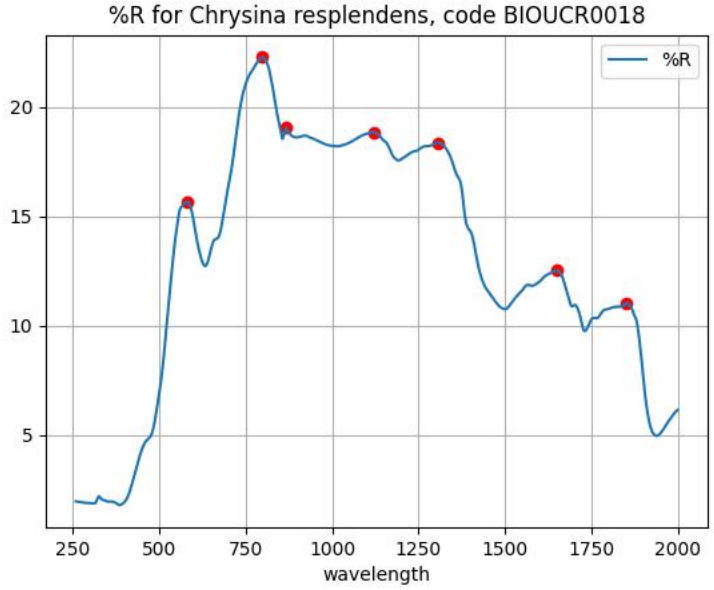

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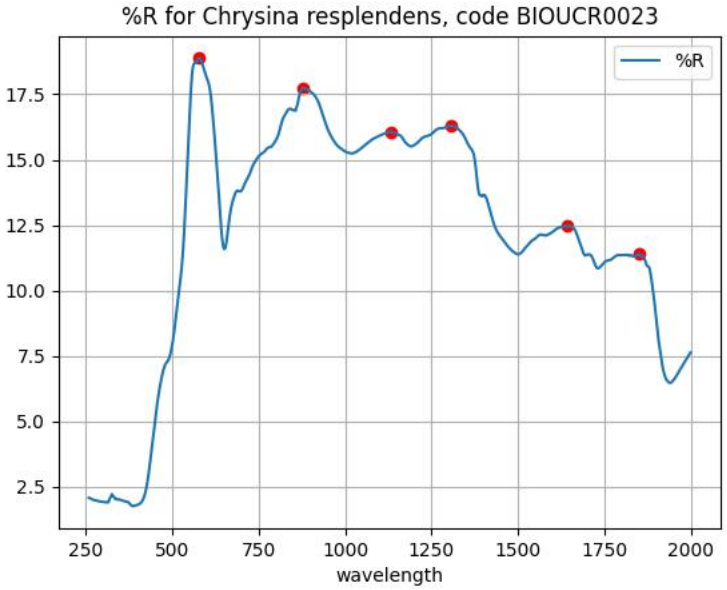

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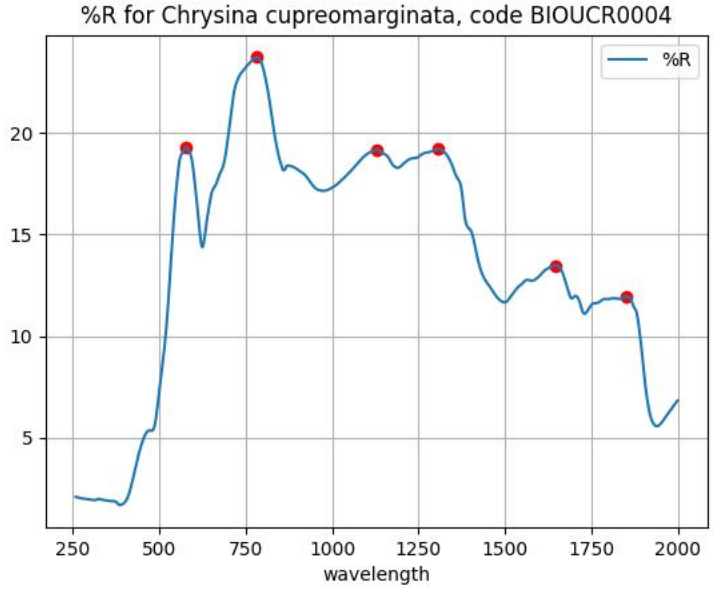

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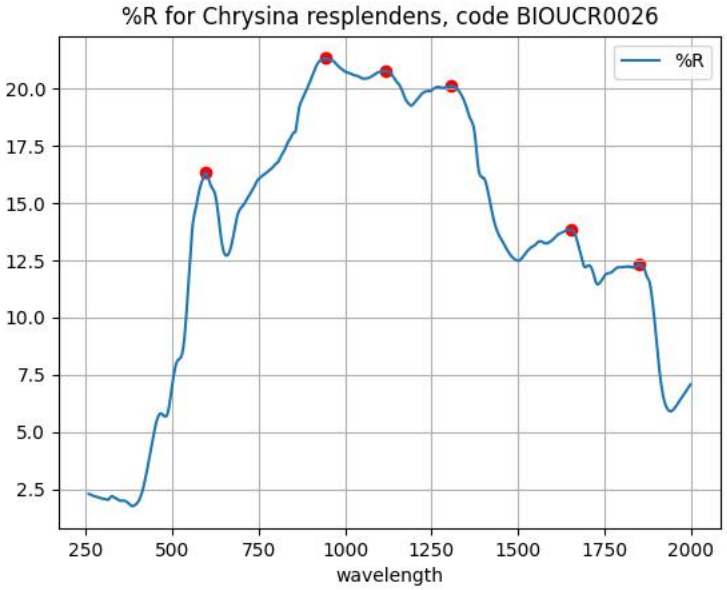

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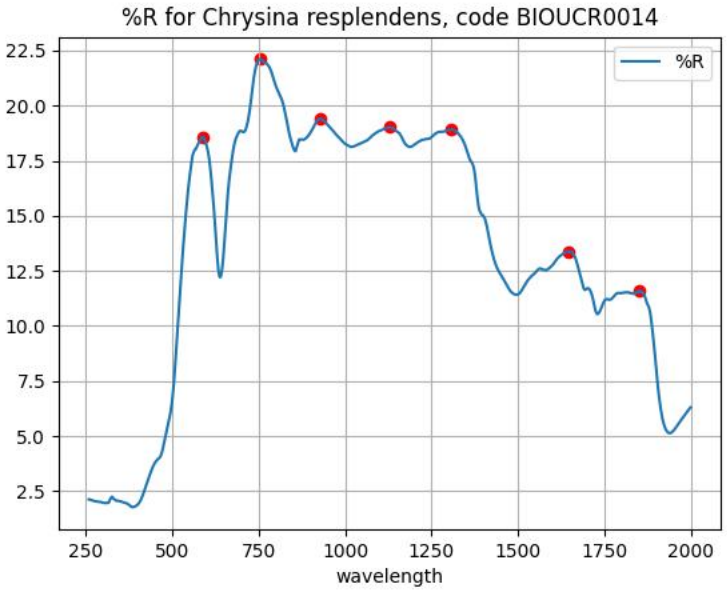

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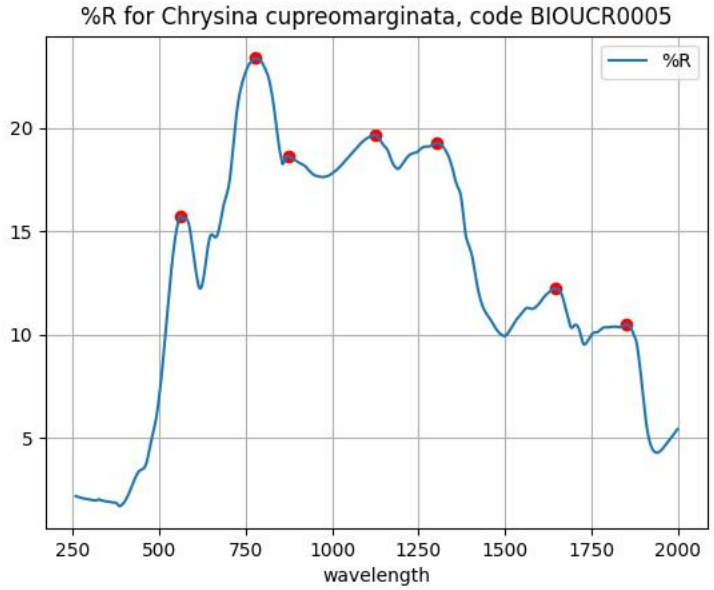

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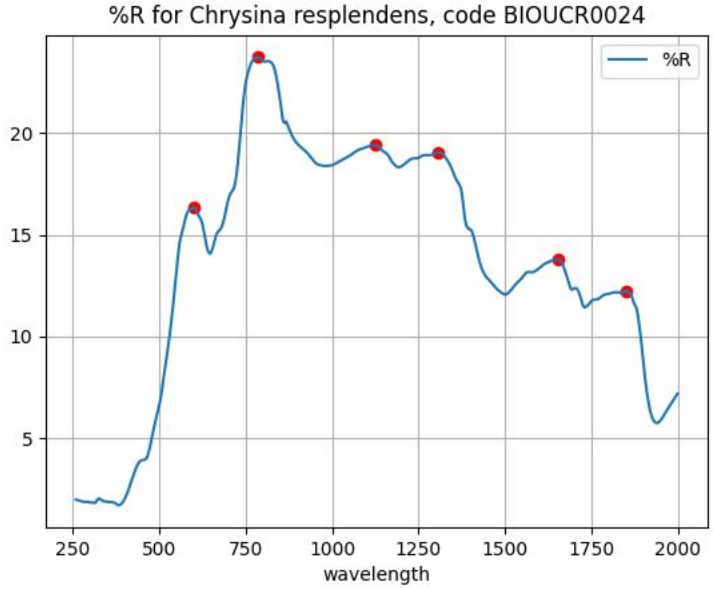

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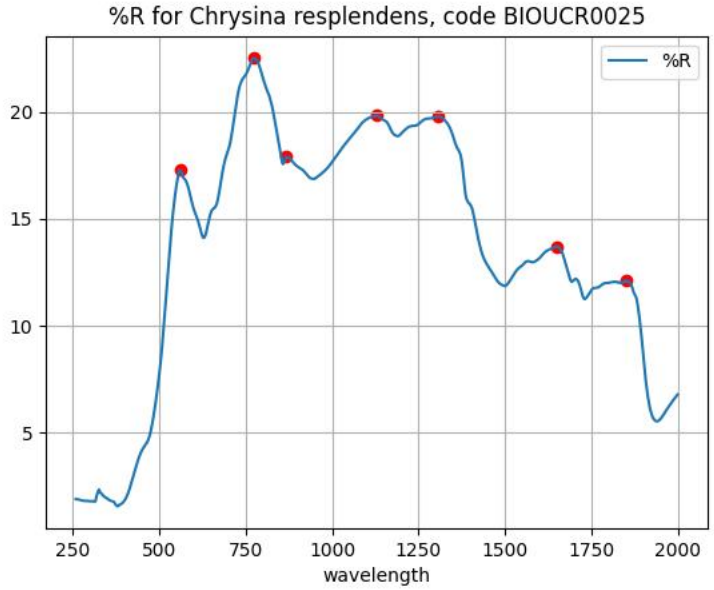

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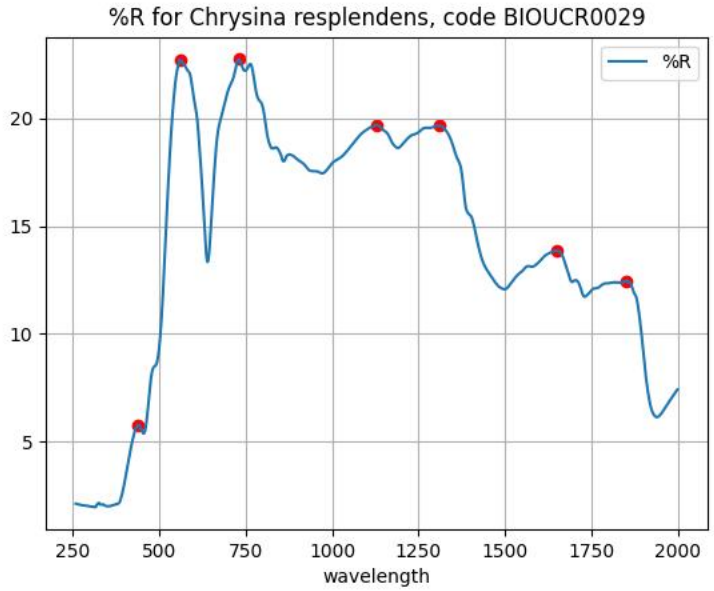

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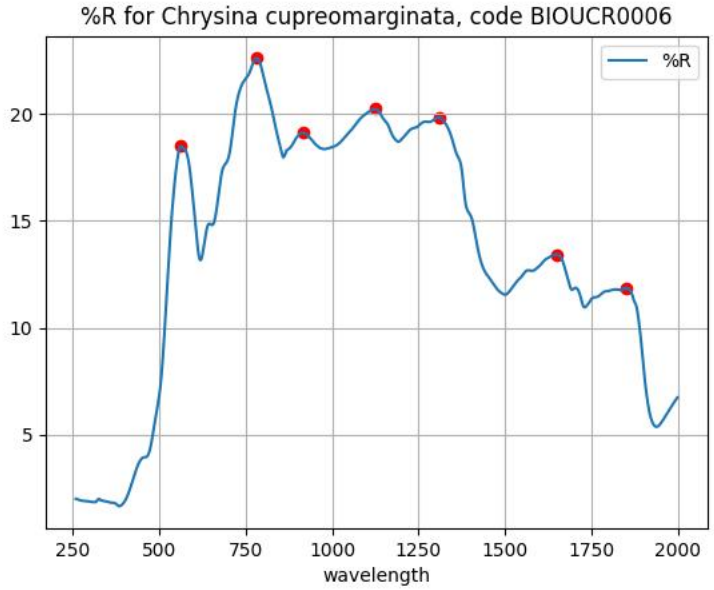
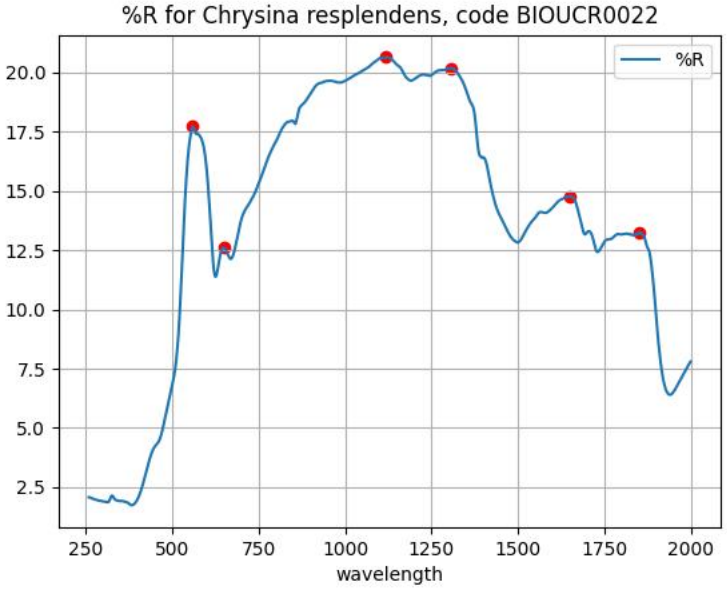
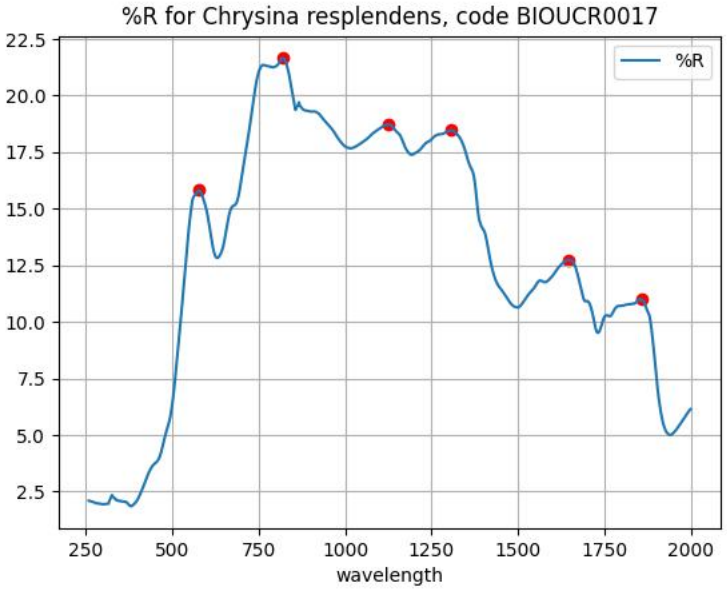


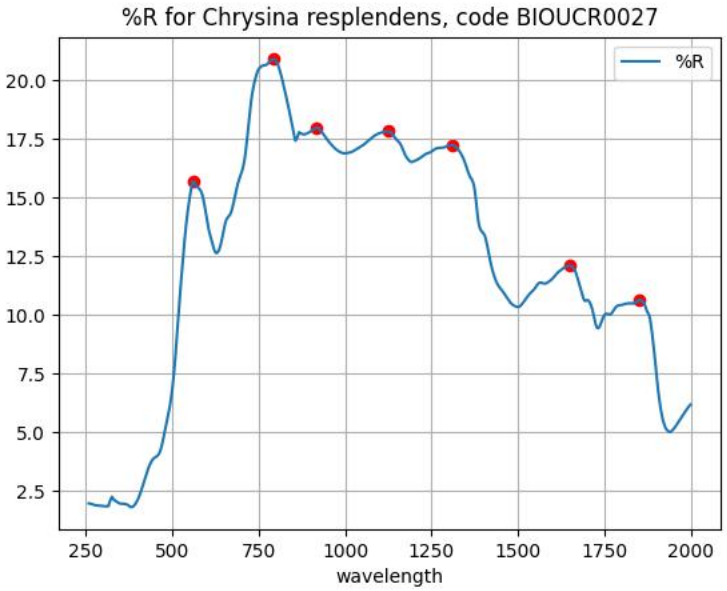
Peaks: [(563.0, 18.480612), (782.0, 22.595725), (916.0, 19.10919), (1125.0, 20.221853), (1309.0, 19.81423), (1651.0, 13.42356), (1850.0, 11.868283)]



Peaks: [(559.0, 17.727642), (649.0, 12.612357), (1118.0, 20.650653), (1306.0, 20.186837), (1649.0, 14.776627), (1851.0, 13.256343)]



Peaks: [(577.0, 15.82383), (819.0, 21.655249), (1127.0, 18.73522), (1307.0, 18.46921), (1648.0, 12.738147), (1857.0, 11.008073)]



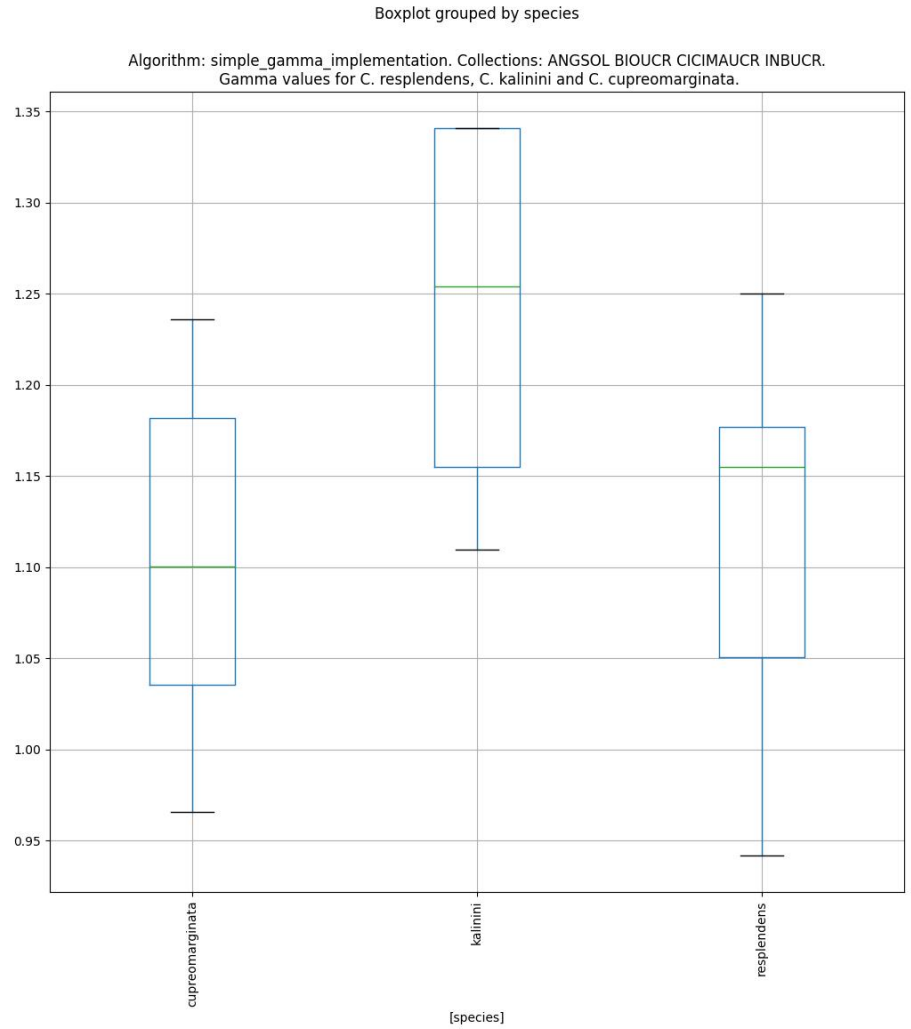
Peaks: [(561.0, 15.683854), (793.0, 20.891274), (918.0, 17.970163), (1124.0, 17.82372), (1309.0, 17.233453), (1650.0, 12.09711), (1851.0, 10.64328)]

Algorithm description: simple_gamma_implementation

This algorithm calculates the ratio between the highest reflectance peak in the visible range and the maximum peak in the IR range up to 1000 nm. Beyond 1000 nm internal structure's reflectance generates noise in the reflectance spectrum.

Results

Gamma boxplot for simple_gamma_implementation



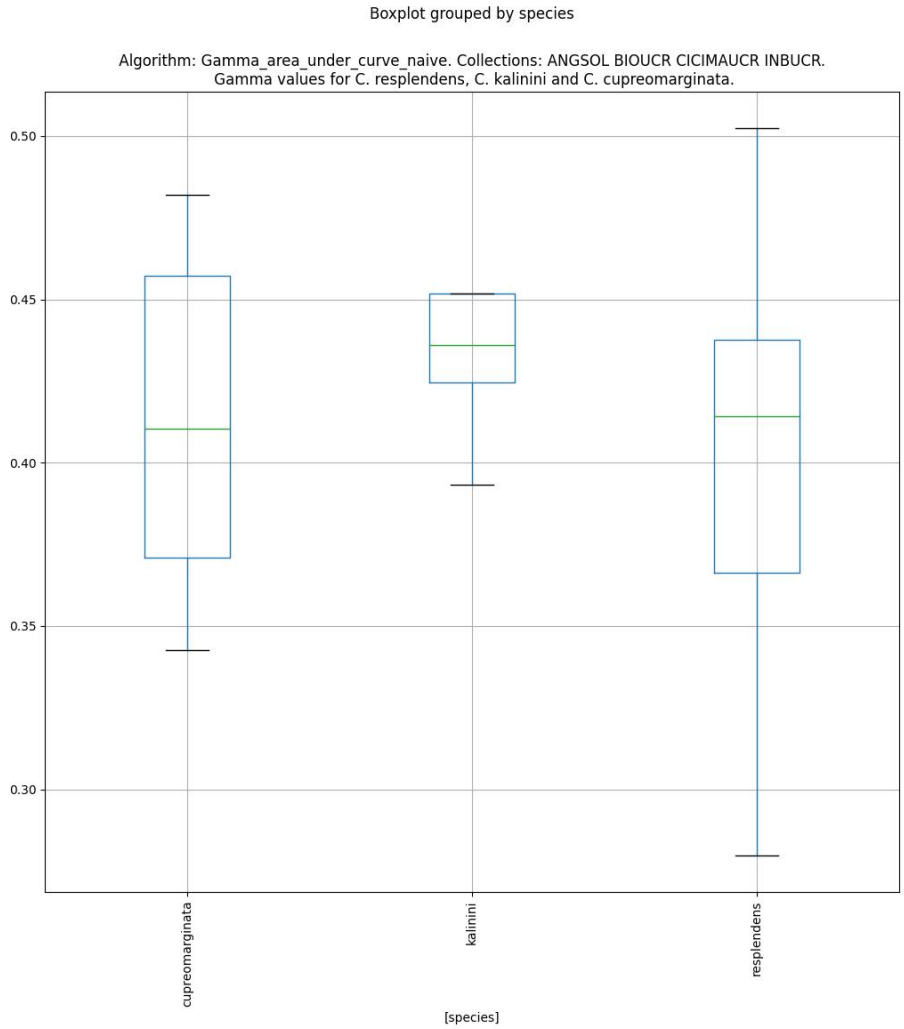
sample_text

Algorithm description: Gamma_area_under_curve_naive

This method calculates the ratio between the area under the curve for the spectrum between 450 and 800 nm (visible range) and between 800 nm and 1500 nm (Infrarred range).

Results

Gamma boxplot for Gamma_area_under_curve_naive



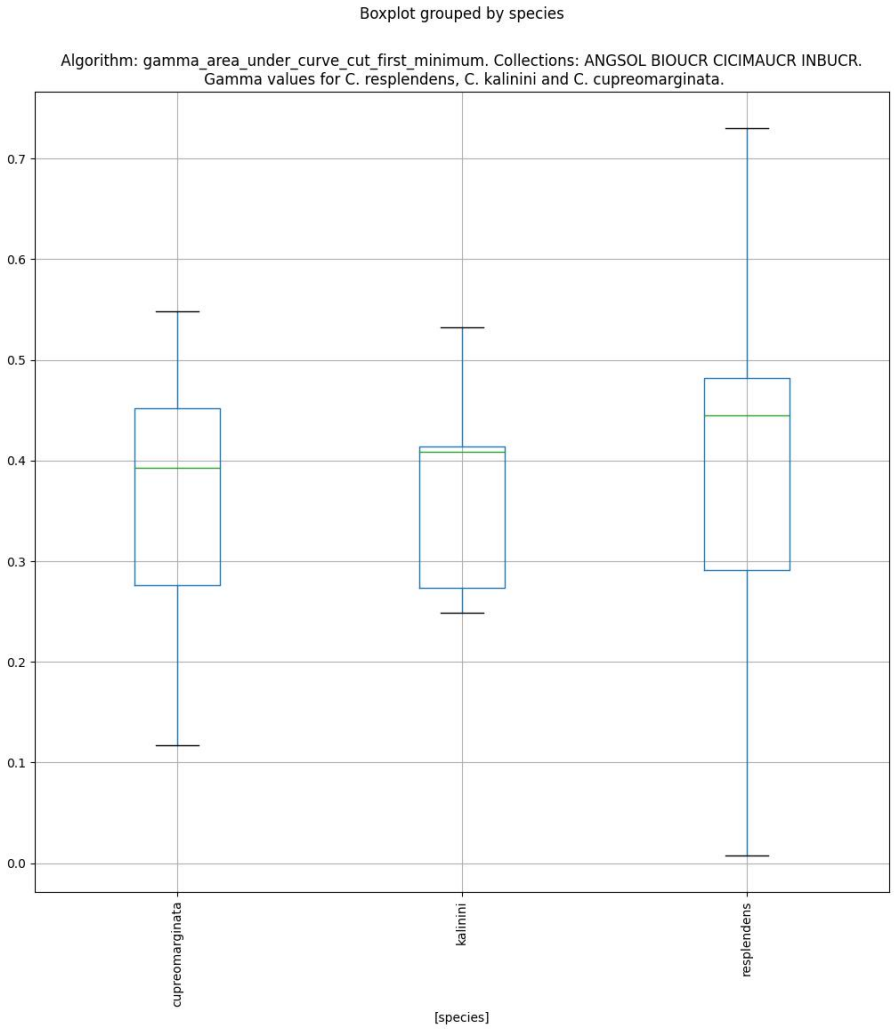
sample_text

Algorithm description: gamma_area_under_curve_cut_first_minimum

This algorithm calculates the area for the visible region (starting at 450 and ending in the first minima between the maximum in the visible range and the maximum in the IR range. Then calculates the area of the IR range up to the second minumum. The ratio between these two areas is the gamma value.

Results

Gamma boxplot for gamma_area_under_curve_cut_first_minimum



sample_text

Similarity Index:

For each spectrum a similarity index is calculated which is the sum of the squared differences between the wavelength peak values of the unknown sample and the average wavelength peak values for each species.

Test results:

The reported(correct) species is compared with the species with the lowest similarity index (si), the final column (test_result) shows if the species coincide:

code	species	kali_si	cupr_si	resp_si	test_result
ANGSOL0011	resplendens	239.67999999999998	202.9	145.0	True
ANGSOL0012	kalinini	96.04	63.5	28.4	False
ANGSOL0017	kalinini	96.6	61.1	32.4	False
ANGSOL0013	cupreomarginata	129.44	81.5	57.8	False
CICIMAUCR0001	kalinini	127.51999999999998	105.3	53.2	False
CICIMAUCR0006	kalinini	231.67999999999998	212.7	144.0	False
CICIMAUCR0158	cupreomarginata	186.64000000000001	163.1	107.4	False
CICIMAUCR0105	kalinini	93.68000000000002	100.7	125.8	True
CICIMAUCR0104	resplendens	175.68	146.9	94.6	True
INBUCR0433	cupreomarginata	76.68000000000002	98.9	171.8	False
INBUCR0426	resplendens	153.8	109.1	83.2	True
BIOUCR0007	cupreomarginata	118.08000000000001	91.9	50.0	False
BIOUCR0019	resplendens	249.32	227.1	154.6	True
BIOUCR0015	resplendens	232.67999999999998	213.7	145.0	True
BIOUCR0028	resplendens	125.63999999999996	104.5	49.0	True
BIOUCR0001	cupreomarginata	122.6	77.9	55.6	False
BIOUCR0021	resplendens	244.32	222.7	154.0	True
BIOUCR0002	cupreomarginata	402.88	383.9	315.2	False
BIOUCR0020	resplendens	127.88000000000002	150.1	223.0	False
BIOUCR0016	resplendens	120.6	81.3	54.4	True
BIOUCR0003	cupreomarginata	96.68000000000002	70.1	27.0	False
BIOUCR0018	resplendens	242.63999999999996	221.9	155.4	True
BIOUCR0023	resplendens	114.0	69.3	45.0	True
BIOUCR0004	cupreomarginata	97.64000000000001	70.7	29.0	False
BIOUCR0026	resplendens	124.24000000000001	78.1	52.2	True

BIOUCR0014	resplendens	236.51999999999998	214.9	146.2	True
BIOUCR0005	cupreomarginata	247.47999999999996	228.5	159.8	False
BIOUCR0024	resplendens	98.28000000000002	68.1	25.0	True
BIOUCR0025	resplendens	247.67999999999998	228.7	160.0	True
BIOUCR0029	resplendens	341.47999999999996	322.5	253.8	True
BIOUCR0006	cupreomarginata	236.47999999999996	217.5	148.8	False
BIOUCR0022	resplendens	125.84	100.3	58.4	True
BIOUCR0017	resplendens	100.2	63.1	32.8	True
BIOUCR0027	resplendens	234.47999999999996	215.5	147.0	True

References

1. Author A, et al. (Year). Title of the paper. Journal Name, Volume(Issue), Page Numbers.
2. Author B, et al. (Year). Title of the paper. Journal Name, Volume(Issue), Page Numbers.