CLAIMS

1. A portable device operable to identify photosynthetic activity and contents of compounds in a plant part, the portable device comprises:

a light source comprising light-emitting diodes operable to irradiate the plant part with light comprising more than one wavelength;

a control module configured to (i) have the light-emitting diodes emit the light as a first pulse signal and a second pulse signal, and (ii) modulate amplitude and width of the first pulse signal and the second pulse signal to provide a different amplitude and width of the first pulse signal and the second pulse signal when the first pulse signal and the second pulse signal are of the same wavelength for identifying photosynthetic activity in the plant part, or to provide identical photoactive radiation when the first pulse signal and the second pulse signal are of a different wavelength for identifying contents of compounds in the plant part;

a focus-adjustable lens and a filter optically coupled to the light source, wherein the adjustable lens and the filter are co-operable to consolidate light reflected from the plant part which is irradiated by light from the light-emitting diodes; and

a detector optically positioned to receive from the focus-adjustable lens and the filter the light reflected from the plant part, wherein the light reflected from the plant part corresponds to the photosynthetic activity and contents of compounds in the plant part, and the light reflected is transmitted as fluorescence.

2. The portable device of claim 1, wherein the light source comprises the light-emitting diodes arranged circumferentially to the detector.

3. The portable device of claim 1 or 2,

wherein the light source comprises the light-emitting diodes arranged circumferentially on a panel, and

wherein the panel comprises an opening which the detector is optically positioned at to receive the light reflected from the plant part.

4. The portable device of any one of claims 1 to 3, wherein the light comprising more than one wavelength has a wavelength ranging from 100 nm to 760 nm.

5. The portable device of any one of claims 1 to 4, wherein the control module is configured to have each of the light-emitting diodes independently emit light at different brightness.

6. The portable device of any one of claims 1 to 5,

wherein the control module is configured to have the light-emitting diodes emit blue light,

wherein the blue light comprises the first pulse signal and the second pulse signal, and

wherein the first pulse signal has a shorter pulse width and a lower amplitude than the second pulse signal.

7. The portable device of any one of claims 1 to 5,

wherein the control module is configured to have the light-emitting diodes emit red light and then green light, and

wherein the red light and the green light are configured to produce identical photoactive radiation.

8. The portable device of any one of claims 1 to 5, wherein

wherein the control module is configured to have the light-emitting diodes emit red light and then ultraviolet light, and

wherein the red light and the ultraviolet light are configured to produce identical photoactive radiation.

9. The portable device of any one of claims 1 to 8, wherein the filter comprises a long-pass filter which consolidates fluorescence reflected from the plant part.

10. The portable device of any one of claims 1 to 9, wherein the detector is a charge-coupled device detector.

11. A method of identifying photosynthetic activity and contents of compounds in a plant part using the portable device of any one of claims 1 to 10, the method comprising:

irradiating the plant part with light comprising more than one wavelength from a light source comprising light-emitting diodes;

operating a control module to (i) have the light-emitting diodes emit the light as a first pulse signal and a second pulse signal, and (ii) modulate amplitude and width of the first pulse signal and the second pulse signal to provide a different amplitude and width of the first pulse signal and the second pulse signal when the first pulse signal and the second pulse signal are of the same wavelength for identifying photosynthetic activity in the plant part, or to provide identical photoactive radiation when the first pulse signal and the second pulse signal are of a different wavelength for identifying contents of compounds in the plant part;

operating a focus-adjustable lens and a filter to consolidate light reflected from the plant part which is irradiated by light from the light-emitting diodes, wherein the focus-adjustable lens and the filter are optically coupled to the light source; and

operating a detector which is optically positioned to receive from the focus-adjustable lens and the filter the light reflected from the plant part, wherein the light reflected from the plant part corresponds to the photosynthetic activity and contents of compounds in the plant part, and the light reflected is transmitted as fluorescence.

12. The method of claim 11, wherein irradiating the plant part with the light comprising more than one wavelength comprises:

operating the light-emitting diodes at a voltage ranging from 0.1 mV to 10 V; and/or

operating each of the light-emitting diodes independently at 0.1 mA to 10 A to emit light at different brightness.

13. The method of claim 11 or 12, wherein operating the control module comprises:

operating the control module to have the light-emitting diodes irradiate blue light having the first pulse signal on the plant part to induce a minimum or steady state fluorescence intensity signal from the plant part;

operating the control module to have the light-emitting diodes irradiate blue light having the second pulse signal on the plant part to induce a maximum fluorescence intensity signal from the plant part in a lit environment; and

wherein the first pulse signal has a shorter pulse width and a lower amplitude than the second pulse signal.

14. The method of claim 13, wherein operating the control module to have the light-emitting diodes irradiate blue light having the first pulse signal on the plant part is carried out in a dark environment or a lit environment.

15. The method of claim 13 or 14, further comprising:

subtracting the maximum fluorescence intensity signal with the minimum or steady state fluorescence intensity signal to obtain a numerator; and

dividing the numerator with the maximum fluorescence intensity signal to identify the photosynthetic activity.

16. The method of claim 11 or 12, wherein operating the control module comprises:

operating the control module to have the light-emitting diodes irradiate red light on the plant part to induce a first far-red fluorescence intensity signal from the plant part, and then irradiate green light on the plant part to induce a second far-red fluorescence intensity signal from the plant part.

17. The method of claim 16, further comprising:

dividing the first far-red fluorescence intensity signal by the second far-red fluorescence intensity signal to obtain a numerical value; and

taking a logarithm of the numerical value to identify anthocyanin content in the plant part.

18. The method of claim 11 or 12, wherein operating the control module comprises:

operating the control module to have the light-emitting diodes irradiate red light on the plant part to induce a first far-red fluorescence intensity signal from the plant part, and then irradiate ultraviolet light on the plant part to induce a second far-red fluorescence intensity signal from the plant part.

19. The method of claim 18, further comprising:

dividing the first far-red fluorescence intensity signal by the second far-red fluorescence intensity signal to obtain a numerical value; and

taking a logarithm of the numerical value to identify a flavonol content in the plant part.