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### PLANT COVER DEVICE WITH TUBULAR SHAPE AND BASE MEMBER AND RELATED METHODS

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#### Abstract

An IPC device is for a plant in a pot. The IPC device includes a support to be positioned in a soil surface of the pot adjacent to the plant and extending upward from the soil surface, and a mesh surface enclosure having an upper end with a sealed apex, and a lower end to surround the pot. The mesh surface enclosure defines a plant-receiving cavity therein, and the mesh surface enclosure has a mesh size to prevent intrusion by psyllids and aphids. The IPC device also includes a spreader device coupled to the support and configured to extend outward to the mesh surface enclosure.

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## Background/Summary

RELATED APPLICATIONS [0001] This application is a continuation of copending application Ser. No. 18/642,024 filed Apr. 22, 2024, now U.S. Pat. No. 12,295,293, which is a continuation of application Ser. No. 17/662,894 filed May 11, 2022, now U.S. Pat. No. 11,968,931, which claims priority to Application No. 63/187,322 filed May 11, 2021. [0002] Application Ser. No. 17/662,894 is a continuation-in-part of application Ser. No. 16/750,271 filed Jan. 23, 2020, now U.S. Pat. No. 11,503,777, which claims priority to Application No. 62/795,864 filed Jan. 23, 2019. [0003] Application Ser. No. 16/750,271 is a continuation-in-part of application Ser. No. 15/359,111 filed Nov. 22, 2016, now U.S. Pat. No. 11,122,752, which claims priority to Application No. 62/259,188 filed Nov. 24, 2015. [0004] Application Ser. No. 16/750,271 is a continuation-in-part of Application No. PCT/US2018/046166 filed Aug. 10, 2018, which claim priority to Application No. 62/543,567 filed Aug. 10, 2017. [0005] Application Ser. No. 17/662,894 filed May 11, 2022, now U.S. Pat. No. 11,968,931, is a continuation-in-part of application Ser. No. 16/637,794 filed Feb. 10, 2020, now U.S. Pat. No. 11,497,176, which is a 371 application of PCT/US2018/046166 filed Aug. 10, 2018, which claim priority to Application No. 62/543,567 filed Aug. 10, 2017. The entire subject matter of these applications is incorporated herein by reference in its entirety.

## TECHNICAL FIELD

[0006] The present disclosure relates to the field of agricultural devices, and, more particularly, to a disease prevention device and related methods.

## BACKGROUND

[0007] The agricultural industry is a large and robust industry worldwide. To meet worldwide demand for agricultural products, producers utilize numerous methods to maximize production in agricultural crops. For example, one technique includes removing unwanted growth (i.e. soil cultivation) around the base of crops to enhance growth and production. Typically, this is accomplished with the application of herbicide around the base of most crops.

[0008] Although there are effective herbicides, there are several drawbacks to their use. Firstly, the adaptation of herbicide resistant “super weeds” has reduced the effectiveness of many herbicides. Secondly, herbicides cannot be applied toward organic fields or directly over non-GMO crops. Thirdly, the application of herbicides may weaken the crop's natural defense, and application to crops prior to harvest may result in crop damage when contacted by spray drift or when absorbed from the soil by the plant's root system.

[0009] Another technique is implementation of a robust fertilization program. Although fertilization programs do enhance growth of crops, they can be costly to implement and maintain. Moreover,

herbicides cannot be applied toward organic fields or directly over non-GMO crops.

[0010] Yet another technique is a robust insecticide program. Of course, this programs provides benefits from evasive insects that harm the crop. Another benefit is the insecticide program may help prevent infection of the crop from disease, such as fungus and bacterial infections.

[0011] One example disease is citrus greening, also known as Huanglongbing (HLB) or yellow dragon disease. Citrus greening disease is one of the most serious citrus plant diseases in the world because there is currently no cure. The disease has devastated millions of acres of citrus crops throughout the United States and abroad. Citrus greening disease is spread by a disease-infected insect, the Asian citrus psyllid

[0012] The infected insect spreads the disease as it feeds on the leaves and stems of citrus trees. Citrus greening disease is further spread by moving infected plants and plant materials.

[0013] The disease has affected the entire US citrus industry, and has been reported in 33 nations worldwide. Infected citrus trees produce fruits that are green, misshapen and bitter, unsuitable for sale as fresh fruit or for juice. Most infected trees die within a few years and have few productive years, if any.

[0014] Citrus greening disease is typically managed using insecticides to control the psyllid population. Evidence shows that reducing psyllid populations via insecticide application not only slows the rate of citrus greening disease spread but also reduces severity of the disease once established.

[0015] Young trees that produce multiple flushes throughout the year are at greater risk of greening infection than mature trees because of the attraction of adult psyllids to the new flush. Even without the disease, young trees need to be protected for about four years from psyllids and leaf miners to grow optimally. In some approaches, soil-applied systemic insecticides provide long lasting control of psyllids, but the chemicals may be environmentally harmful.

[0016] In other approaches, tree covers that enclose a tree to prevent insect infiltration are deployed. These tree cover approaches, however, may suffer from one or more drawbacks. The tree cover may rest its weight against the tree, which can damage foliage and branches of young trees. In some approaches, the tree covers may have a Skelton-like framework that prevents the cover from resting against the foliage, but the framework may provide for a more complicated install.

## SUMMARY

[0017] Generally, an individual plant cover (IPC) device is for a plant in a pot. The IPC device comprises a support to be positioned in a soil surface of the pot adjacent to the plant and extending upward from the soil surface, and a mesh surface enclosure comprising an upper end with a sealed apex, and a lower end to surround the pot. The mesh surface enclosure defines a plant-receiving cavity therein, and the mesh surface enclosure has a mesh size to prevent intrusion by psyllids and aphids. The IPC device also includes at least one spreader device coupled to the support and configured to extend outward to the mesh surface enclosure.

[0018] In particular, the IPC device may also include a first coupling device to wrap around the lower end and configured to cause the lower end to abut the pot, and a second coupling device to wrap around the upper end and configured to cause the upper end to abut the support. For example, each of the first coupling device and the second coupling device may comprise one of a zip tie, a tether, and a wire.

[0019] In some embodiments, the at least one spreader device may comprise first and second opposing loops coupled to the support. The at least one spreader device may comprise a plurality of spreader devices to be coupled to the support. Also, the mesh surface enclosure may comprise a plurality of panels coupled together at respective panel seams. The upper end may be cone-shaped, for example. The mesh size of mesh surface enclosure may provide for water permeability and light transmissivity.

[0020] Another aspect is directed to a plant cover assembly for a row of plants. The plant cover assembly comprises a plurality of IPC devices respectively arranged over the row of plants. Each

IPC device comprises a mesh surface enclosure comprising an upper end with a sealed apex, and a lower end to surround a respective plant. The mesh surface enclosure defines a plant-receiving cavity therein, the mesh surface enclosure having a mesh size to prevent intrusion by psyllids and aphids. The plant cover assembly also includes first and second supports respectively at first and second ends of the row of plants, and at least one wire sequentially being coupled to the first support, the plurality of IPC devices, and the second support.

[0021] In particular, each of the first support and the second support may comprise a mast extending from a ground surface, and first and second arms extending laterally from the mast. The at least one wire may comprise a first wire, a second wire, and a third wire respectively coupled to a distal end of the first arm, a distal end of the second arm, and the mast. The third wire may be coupled to the sealed apex of each of the plurality of IPC devices.

[0022] Yet another aspect is directed to a plant cover assembly for a row of plants. The plant cover assembly comprises a plant cover device arranged over the row of plants and having a mesh surface. The plant cover device comprises an upper end with a sealed apex, and a lower end to surround lowermost portions of plants in the row of plants. The mesh surface has a mesh size to prevent intrusion by psyllids and aphids. The plant cover device also includes first and second supports respectively at first and second ends of the row of plants, and a plurality of spreader devices arranged within the row of plants, each spreader device to extend to the plant cover device.

[0023] In some embodiments, each spreader device may comprise a support extending from a ground surface, a bracket coupled to an uppermost portion of the support, and a pair of support arms extending from the bracket. In other embodiments, each spreader device may comprise a support extending from a ground surface, a plurality of brackets coupled to the support, and a plurality of support arm pairs respectively extending from the plurality of brackets. The plurality of brackets may be vertically aligned. Each of the plurality of support arm pairs may be arranged to be transverse to the row of plants. The lower end may comprise a solid section. The lower end may be anchored to a ground surface.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. 1 is a perspective view of a first example of the plant cover system installed so as to enclose a young tree.

[0025] FIG. 2 is a front view of an example of the plant cover bag.

[0026] FIG. 3 is a back view thereof.

[0027] FIG. 4 is another back view of the plant cover bag showing the margins separated to increase the size of the opening.

[0028] FIG. 5 is a back view of another example of the plant cover bag with a slot that extends to the upper section of the bag.

[0029] FIG. 6 is a back view of another example of the plant cover bag with a slot that extends closer to the side apex than in the first example.

[0030] FIG. 7 is a perspective view of a second example of the plant cover system installed so as to enclose a young tree.

[0031] FIG. 8 is a front view of the bag in the second example.

[0032] FIG. 9 is a back view thereof.

[0033] FIG. 10 is a diagrammatic illustration of the first example of the plant cover system enclosing a young tree with the wall of the bag shown as transparent so that the interior of the bag is more clearly visible.

[0034] FIG. 11 is a perspective view of another example of the plant cover system installed so as to enclose a young tree where the bag includes a base member.

[0035] FIG. **12** is a perspective view of another example of the plant cover system installed so as to enclose a young tree where the bag includes a base member and the slot extends further up the bag than in the example of FIG. **11**.

[0036] FIG. **13** is a partial view of the base member.

[0037] FIG. **14** is a top perspective view of the base member with the margins separated.

[0038] FIG. **15** is a bottom view of the base member.

[0039] FIG. **16** is an example of an irrigation line that may be used.

[0040] FIG. **17** is an example of a support member that may be used.

[0041] FIG. **18** is another example of a support member that may be used.

[0042] FIG. **19** is a schematic side view of a plant cover device, according to the present disclosure.

[0043] FIG. **20** is another schematic side view of the plant cover device from FIG. **19**.

[0044] FIG. **21** is a schematic bottom plan view of the plant cover device from FIG. **19**.

[0045] FIG. **22** is a portion of a schematic bottom plan view of the plant cover device from FIG. **19**.

[0046] FIG. **23** is a portion of a schematic bottom plan view of the plant cover device from FIG. **19** with the first and second fasteners opened.

[0047] FIG. **24A** is a schematic side view of another embodiment of the plant cover device, according to the present disclosure.

[0048] FIG. **24B** is a schematic side view of the support from the plant cover device of FIG. **24A**.

[0049] FIG. **24C** is a schematic side view of a portion of the support from the plant cover device of FIG. **24A**.

[0050] FIG. **25** is a schematic side view of another embodiment of a plant cover device, according to the present disclosure.

[0051] FIG. **26A** is a schematic top view of the plant cover device of FIG. **25**.

[0052] FIG. **26B** is a schematic cross-sectional view of a medial seam of the plant cover device of FIG. **25**.

[0053] FIG. **27** is a schematic side view of the plant cover device of FIG. **25** during assembly.

[0054] FIG. **28** is a schematic cross-sectional view of another embodiment of a plant cover device, according to the present disclosure.

[0055] FIG. **29** is a schematic cross-sectional view of yet another embodiment of a plant cover device, according to the present disclosure.

[0056] FIG. **30** is a schematic cross-sectional view of another embodiment of a plant cover device, according to the present disclosure.

[0057] FIG. **31** is a schematic top view of another embodiment of a plant cover device with the mesh removed, according to the present disclosure.

[0058] FIG. **32** is a schematic top view of yet another embodiment of a plant cover device with the mesh removed, according to the present disclosure.

[0059] FIG. **33** is a schematic cross-sectional view of yet another embodiment of a plant cover device, according to the present disclosure.

[0060] FIG. **34** is a schematic cross-sectional view of yet another embodiment of a plant cover device without the plant, according to the present disclosure.

[0061] FIG. **35** is a schematic cross-sectional view of yet another embodiment of a plant cover device, according to the present disclosure.

[0062] FIG. **36** is a schematic cross-sectional view of yet another embodiment of a plant cover device, according to the present disclosure.

[0063] FIG. **37A** is a bottom plan view of the plant cover device of FIG. **36**.

[0064] FIG. **37B** is a schematic cross-sectional view of the plant cover device of FIG. **36** along line **37-37**.

[0065] FIG. **38** is a schematic cross-sectional view of yet another embodiment of a plant cover device, according to the present disclosure.

[0066] FIG. **39** is a schematic cross-sectional view of yet another embodiment of a plant cover device, according to the present disclosure.

[0067] FIG. **40** is a schematic side view of the pole from the plant cover device of FIG. **39**.

[0068] FIGS. **41A** & **41B** is a schematic top and bottom plan views of a spreader device, according to the present disclosure.

[0069] FIG. **42** is a schematic cross-sectional view of yet another embodiment of a plant cover device, according to the present disclosure.

[0070] FIG. **43** is a perspective view of a plant cover assembly for a row of plants without the IPC devices, according to the present disclosure.

[0071] FIGS. **44-45** are perspective views of the plant cover assembly of FIG. **43** with the IPC devices.

#### DETAILED DESCRIPTION

[0072] The present disclosure will now be described more fully hereinafter with reference to the accompanying drawings, in which several embodiments of the invention are shown. This present disclosure may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present disclosure to those skilled in the art. Like numbers refer to like elements throughout; prime notation is used to indicate similar elements in alternative embodiments; and base **100** reference numerals are used to indicate similar elements in alternative embodiments.

[0073] Generally, an individual plant cover (IPC) device may include a pole in a ground surface. The IPC device also includes an upper end comprising tapered walls extending inwardly from a base and into an apex to abut the pole, and a seam extending along a peripheral edge of the tapered walls, each tapered wall comprising a major mesh surface. The upper end defines a plant-receiving cavity therein. The IPC device also includes a lower tubular end opposite the upper end and comprising a first end, a second end opposite the first end, and a major mesh surface extending between the first end and the second end. The lower tubular end also defines the plant-receiving cavity therein. The IPC device also includes a medial seam coupling the base of the upper end and the first end of the lower tubular end. The IPC device also includes a curved flexible support carried by the medial seam. The IPC device also includes a base member coupled to the second end of the lower tubular end and extending inwardly and transversely to the lower tubular end and to cover the ground surface adjacent the pole.

[0074] The lower tubular end may comprise a vertically extending fastener for permitting access to the plant-receiving cavity. In some embodiments, the second end of the lower tubular end may comprise a solid section. The IPC device may include a plurality of spreader devices coupled to the pole and extending into the upper end and the lower tubular end. Each spreader device may include first and second opposing loops coupled to the pole.

[0075] In other embodiments, the IPC device may further comprise a plurality of growing medium containers coupled to the pole. The pole may include a plurality of openings therein and aligned with the plurality of growing medium containers. The IPC device may also include growing medium within a lowermost portion of the lower tubular end. Also, the base member may comprise a solid section.

[0076] Another aspect is directed to a method for making an IPC device. The method also includes forming an upper end comprising tapered walls extending inwardly from a base and into an apex to abut a pole, and a seam extending along a peripheral edge of the tapered walls. Each tapered wall comprises a major mesh surface, and the upper end defines a plant-receiving cavity therein. The method also includes forming a lower tubular end opposite the upper end and comprising a first end, a second end opposite the first end, and a major mesh surface extending between the first end and the second end. The lower tubular end also defines the plant-receiving cavity therein. The method also includes coupling the base of the upper end and the first end of the lower tubular end

with a medial seam. The method also includes positioning a curved flexible support to be carried by the medial seam. The method also includes coupling a base member to the second end of the lower tubular end and extending inwardly and transversely to the lower tubular end and to cover a ground surface adjacent the pole.

[0077] Another aspect is directed to a method for installing an IPC device. The IPC device comprises an upper end comprising tapered walls extending inwardly from a base and into an apex to abut a pole, and a seam extending along a peripheral edge of the tapered walls. Each tapered wall comprises a major mesh surface. The upper end defines a plant-receiving cavity therein. The IPC device also includes a lower tubular end opposite the upper end and comprising a first end, a second end opposite the first end, and a major mesh surface extending between the first end and the second end. The lower tubular end also defines the plant-receiving cavity therein. The IPC device also comprises a medial seam coupling the base of the upper end and the first end of the lower tubular end, a curved flexible support carried by the medial seam, and a base member coupled to the second end of the lower tubular end and extending inwardly and transversely to the lower tubular end. The method also includes positioning the IPC device over a plant and a pole adjacent the plant in a ground surface, and positioning the base member to cover the ground surface adjacent the pole.

[0078] Young citrus trees are at greater risk than mature trees of infection because of frequent leaf flush (fresh growth) which attracts the psyllid as well as many other pests as the young tree grows. The plant cover system described here may advantageously be used to protect young citrus trees for the first three years and beyond after planting. However, it should be recognized that the cover can also be used on a wide variety, size, and age of fruit trees, ornamentals, vegetables, and the like. It is to be understood that the term “plant” as used herein may include trees. For example, “a plant cover” refers to a cover for trees and other plants.

[0079] Referring to FIG. 1, a first example embodiment of the plant cover system **100** includes a plant cover bag **200** upwardly supported by a vertical support member **300** over a tree **102**. The bottom of the bag **200** is closed around the trunk **104** of the tree **102**. An optional trunk cover **400** encircles the trunk. A closure **500** closes the bottom of the bag **200** around the trunk **104**.

[0080] Additional details of the bag **200** are now described with reference to FIGS. 2-6. The bag **200** has a generally kite shaped exterior perimeter **202** and is formed from a first kite shaped panel **204** and a second kite shaped panel that are joined together along a seam **208** forming the exterior perimeter **202** by a conventional joining mechanism such as using an adhesive, sewing, stapling, or the like.

[0081] The seam **208** adds rigidity to the exterior perimeter **202**, allowing the exterior perimeter **202** to maintain its kite shape without a separate support frame when suspended over a tree. This allows the midsection of the bag **200** to bulge out around the tree's foliage so that the bag **200** does not rest its weight against the foliage.

[0082] An upper section **210** of the bag **200** is generally triangle shaped. A lower section **212** of the bag **200** is generally trapezoid shaped. A bottom end of the bag **200** includes a rim **214** that circumscribes an opening **216** to the bag's interior **218**.

[0083] A slot **220** interrupts the seam **208**, extends vertically from the opening **216**, and includes a pair of opposed margins **222** that include cooperatively interlocking parts **224** that can temporarily be joined and separated to increase the size of the opening when installing over a plant. The interlocking joining mechanism for the margins **222** may be a hook and loop type closure such as hook and loop interface, a zipper, or the like. The entire length of the slot **220** may be completely closed to prevent insects from entering through the slot **220**.

[0084] Referring to FIGS. 5 & 6, the length of the slot **220** may vary among different examples to accommodate different sizes and shapes of plants and trees. In the example of FIG. 6, the slot **220** extends from the opening **216** to the upper section **210** of the bag **200** and terminates before reaching the bag's top apex **224**. In the example of FIG. 7, the slot **220** extends from the opening

**216** and part of the way to the side apex **226**. If the plant being covered is a fruit or vegetable plant, the extended slot **220** can be opened to harvest the fruits or vegetables from the plant and then closed.

[0085] The panels **204**, **206** form a wall that encloses the interior of the bag **200**. The panels **204**, **206** may be made at least partially or completely of a mesh material, which provides water permeability and light transmissivity, but prevents intrusion by small insects such as psyllids. The mesh size may be, for example, 50 mesh or 50 by 25 threads per square inch. Such a mesh size will be sufficient to prevent intrusion by psyllids, aphids, white flies, mealy bugs, leaf miners, thrips, grasshoppers, ants, and orange dogs. The bag **200** may also protect the enclosed foliage from frost, hail, and wind damage.

[0086] Referring to FIGS. 7-9 a second example embodiment of the bag **200'** includes three kite shaped panels instead of two. In FIGS. 7-9 a prime symbol (') denotes features corresponding to the previous example. The three kite shaped panels **204'**, **205**, & **206'** are joined together at the seam **208'** so that the bag has three side vertices **226'**. This configuration provides more interior volume than in the first example to accommodate larger plants and trees.

[0087] Referring to FIG. 10, the vertical support member **300** may be inserted into the ground like a stake adjacent to the tree **102** so that it extends vertically alongside and in close proximity to the tree **102**. The top end **302** upwardly supports the bag **200**, keeping the bag **200** from resting on the tree **102** and suspended above the ground. The top of the tree and the top end **302** are offset by a height **H1** to allow the tree **102** to grow within the bag **200**. The top apex **224** of the bag **200** is positioned atop the top end **302** of the vertical support member **300**. The seam **208** provides enough rigidity to the bag **200** to maintain its kite shape. The opening **216** is closed around the trunk **104** of the tree **102** with the closure **500**.

[0088] The vertical support member **300** may take on many different forms. In the example shown, the vertical support member is a rod-shaped or tubular stake with a plastic or rubber cap **304** on the top end **302** that prevents the vertical support member from causing wear to the bag **200** when the bag **200** moves in the wind, which could generate holes in the bag **200**. In other examples, it may include arms extending horizontally from the stake to support the sides of the bag **200** and produce a support frame.

[0089] The closure **500** is a string, belt, band, or the like that circumscribes the bag **200** and can be tightened to close the opening **216**. The closure **500** may take many different forms such as a drawstring integrally formed with the bag **200**, a separate string or rope that can be tied around the bag, a zip or cable tie, a belt, an elastic band, and the like.

[0090] The bag's **200** kite shape provides an advantage over other conventional plant covers. The kite shape makes the bag **200** somewhat form fitting to the shape of a tree. It is skinnier at the bottom and top and bulges in the middle to accommodate branches and foliage. The kite shape also provides room for the tree to grow both taller and wider within the bag **200**.

[0091] The trunk cover **400** encloses the trunk **104** of the tree by encircling it. The trunk cover **400** may be a conventional tubular tree trunk cover or tree trunk wrap. In the example of FIG. 1, the trunk cover **400** has plastic tubular construction and extends from the ground up the trunk. The bag's opening **216** is tightened closed against the trunk cover **400** around the trunk **104**. The trunk cover **400** may have a reflective exterior surface. The trunk cover **400** may reduce the amount of pesticides that need to be applied to the tree because it will prevent insect damage.

[0092] In an exemplary method of covering a plant using the bag, plant foliage is positioned within the bag **200** by lowering the bag **200** over the plant through the opening **216** in the bag **200**. The bag is suspended the bag on a stake positioned next to the plant. The stake extends above the top of the plant. The opening is then closed around a stem or trunk of the plant. To make it easier to position the foliage within the bag **200**, the slot **220** may be temporarily opened to increase the size of the opening **216**. Once the foliage is within the bag, the slot **220** may then be closed.

[0093] The bag **200** is easily removable from the plant or tree when no longer needed even though



the plant or tree covered might have grown because the slot **220** can be opened during removal. The bag **200** and vertical support member **300** may then be reused. The bag **200** is lightweight and flexible, allowing for efficient storage and/or shipment. When not in use, the bag **200** may be folded or rolled up for storage.

[0094] Another example embodiment of the plant cover system **200** will now be described with reference to FIGS. **11-16**. This example includes a bag **200** including any of the features already described and a base member **300**. The base member **300** is attached to the bag **200** along a seam **302**.

[0095] The base member **300** includes an upper surface **304**, a lower surface **306** opposite the upper surface **304**, and a perimeter **308**. The perimeter **308** in the example shown is substantially circular. The perimeter **308** may have different shapes in different examples.

[0096] The base member **300** includes an irrigation member **310** configured to provide a mechanism for irrigating a plant within the bag **200**. In the example embodiment shown, the irrigation member **310** includes a tubular wall **312** defining an opening **314** and an interior space **316** extending substantially around the perimeter **308**.

[0097] The interior space **316** receives an irrigation line **400**, such as the example shown in FIG. **16**. The irrigation line **400** is adapted to deliver water to the plant by including openings **402** along its length through which water can escape. Water leaving the irrigation line **400** exits the irrigation member **310** by openings **320** formed in the bottom **306** of the irrigation member **400**. In this example the irrigation member **310** is positioned along the perimeter **308** in order to deliver water to the outer reaches of the plant's root system. It is not necessary for the irrigation member **310** to be positioned along the perimeter **308** in every example.

[0098] The base member **300** may include a shape maintaining feature for maintaining the shape of the perimeter **308**. Such a shape maintaining feature may be attached to the base member about or along the perimeter **308**. The shape maintaining feature may include a wire, cable, rope, resilient pole, or the like.

[0099] The base member **300** defines an opening **322** through which the base of the plant may be positioned. The opening **322** in the example shown coincides with the seam **302** where the base member **300** and bag **200** are connected. The shape of the opening **322** is triangular in the example shown, but it may be another shape in other examples.

[0100] The base member **300** includes a pair of opposed margins **324** having cooperatively interlocking parts **326** that can temporarily be joined and separated to increase the size of the opening **322**. When joined together, the margins **324** define a closed slot **328**.

[0101] The margins **324** of the base member **300** may be a continuation of the margins **222** of the bag **200** such that when the margin **222**, **324** are separated the slot **328** in the base member **300** and slot in the bag **200** open together to form a single continuous opening for placing the bag **200** over a plant.

[0102] The base member **300** may be made of water impermeable material such as plastic or the like to maintain water used for irrigation in the vicinity of the plant's roots in order to enhance the efficiency of irrigation. The base member **300** also forms a barrier to insects and other pests around the base of the plant.

[0103] The base member **300** may be secured in position around the plant via many mechanisms such as anchoring with stakes and/or by placing soil on top of the perimeter to weigh down the base member **300**. Optionally, the top surface **304** of the base member **300** includes a reflective material that provides a mirror like finish. The base member **300** may also be used without the bag as a mechanism for retaining water in the vicinity of the plant's roots.

[0104] Referring to FIGS. **17** and **18**, in order to hold the central portion of the base member **300** off the ground, a support frame **500** may be used. The support frame may be made of metal, plastic or the like. The support frame **500** includes two inverted V-shaped stands **502** interconnected by at least one cross beam **504**. In use, the bottom of the V-shaped stands **502** is placed in contact with

the ground and the weight of the base member **300** is supported by the support frame **500**.  
[0105] Referring now additionally to FIGS. **19-22**, a plant cover device **630** is now described. The plant cover device **630** illustratively includes an enclosure **631**, a base **632** coupled to the enclosure, and a support **633** extending vertically from a ground surface to an apex of the enclosure.

[0106] In the illustrated embodiment, the support **633** (shown in dashed lines) comprises a simple pole support. In other embodiments, the support **633** may comprise additional lateral supports at a lowermost end adjacent the ground surface. Also, in some embodiments, the support **633** may include lateral arms extending from the uppermost section of the support, creating a canopy of sorts within the enclosure **631**, or a dome-shaped portion for supporting the enclosure.

[0107] The enclosure **631** illustratively includes a plurality of panels **634a-634c** coupled together to define a plant-receiving cavity therein. Each of the plurality of panels **634a-634c** has a “kite-shape”, or in other words, the shape of two adjacent oblique triangles with abutting base sides.

[0108] This plant-receiving cavity is perhaps best seen in the embodiment of FIG. **7**. Each of the plurality of panels **634a-634c** includes a major mesh surface **635a-635c**, and a seam **636a-636c** extending along a peripheral edge of the major mesh surface. The mesh openings in the major mesh surface **635a-635c** are sized to as to prevent penetration by disease carrying insects.

[0109] Adjacent panels **634a-634c** are coupled together at respective seams **636a-636c**. Each seam **636a-636c** may comprise one or more of a stitching seam, an adhesive seam, or an integrally formed seam (e.g. attached using a heat gun applied to thermoplastic material).

[0110] The enclosure **631** illustratively includes a first fastener **637** adjacent the peripheral edge of a respective panel **634a-634c**. The first fastener **637** extends along only a portion of the peripheral edge of a respective panel **634a-634c** (e.g. the illustrated 33%  $\pm$ 10). In other embodiments, the first fastener **637** extends along a greater portion of the peripheral edge of a respective panel **634a-634c**, such as extending along the edge to the corner or along an entire longitudinal side of the enclosure **631**.

[0111] In the illustrated embodiment, the first fastener **637** comprises opposing hook and loop interfaces on peripheral edges of adjacent panels **634a-634c**. Of course, in other embodiments, other fastening arrangements can be used on peripheral edges of adjacent panels **634a-634c**, such as a button and slit interface, or a snap button interface (e.g. riveted snap fastener).

[0112] The base **632** illustratively includes a solid major surface **638** extending radially outward, and a second fastener **640** carried by the solid major surface and extending radially from a center to an outer peripheral edge. The base **632** illustratively has a circle-shape. In other embodiments, the base **632** may have other shapes, such as a square, an oval, or a triangle

[0113] As perhaps best seen in FIG. **23**, the first fastener **637** and the second fastener **640** are aligned and configured to provide access to the plant-receiving cavity. In particular, the first fastener **637** and the second fastener **640** are directly aligned in an abutting arrangement so that a user can readily open the first fastener **637** and the second fastener **640** in one easy action.

[0114] In particular, the plurality of panels **634a-634c** illustratively defines a trunk receiving opening **641** at a bottom thereof. In some embodiments, the plant cover device **630** includes a tie or tether (see FIGS. **1, 7 & 10**) configured to bind the lower portion of the enclosure **631** to the truck of the plant. The base **632** illustratively defines a medial opening **642** coupled (e.g. via a seam constituted similarly to the seams **636a-636c** in the plurality of panels **634a-634c**) to the trunk receiving opening **641**. The second fastener **640** extends from the medial opening **642** to the peripheral edge of the base **632**. Each of the trunk receiving opening **641** and the medial opening **642** is illustratively triangle-shaped. In other embodiments, the trunk receiving opening **641** and the medial opening **642** may have other shapes, such as a square, an oval, or a circle.

[0115] The base **632** illustratively includes a peripheral passageway **643** carried by the solid major surface **638** and configured to receive a drip line (not shown). The base **632** illustratively includes a plurality of spaced apart notches **644a-644c** along the peripheral passageway **643** configured to

receive respective nozzles from the drip line. As perhaps best seen in FIG. 22, each of the plurality of spaced apart notches **644a-644c** comprises opposing first edges **645a-645b**, and opposing second edges **646a-646b**. The first and second edges **645a-645b**, **646a-646b** are canted with respect to each other. Each second edge **646a-646b** is substantially perpendicular a (equating to an angle of 75°-105°) to a tangential line of the outer periphery of the base **632**.

[0116] In some embodiments, the major mesh surface **635a-635c** of each of the plurality of panels **634a-634c** may comprise a polyvinyl chloride (PVC) material. The major mesh surface **635a-635c** of each of the plurality of panels **634a-634c** may comprise a colored mesh material configured to selectively diffract one or more spectral portions (i.e. frequency ranges) of UV radiation and/or visible light radiation.

[0117] Advantageously, the major mesh surface **635a-635c** of each of the plurality of panels **634a-634c** can be of different color in order to manipulate or enhance the different spectral portions of the UV spectrum. This is important for keeping a plant in a vegetative state or forcing it into a flowering state in regards to some of the intended uses. As will be appreciated, different spectral portions of the visible light spectrum and the UV spectrum can have wide ranging effects on different plants. For example, for UV radiation, —No exposure produces better growth; Violet—Enhances the color, taste, and aroma of plants Blue—Increases the growth rate of plants; Green—Enhances chlorophyll production and is used as a pigment for proper plant viewing; Yellow—Plants exhibit less growth compared to blue and red light; Red—When combined with blue light it yields more leaves and crops, depending on what is being grown; and Far Red—Speeds up the Phytochrome conversion which reduces the time a plant takes to go into a night-time state. This allows the plant to produce a greater yield. See Klein, R. M., Edsall, P. C., & Gentile, A. C. (1965). Effects of Near Ultraviolet and Green Radiations on Plant Growth. Plant Physiology, 40(5), 903-906; and “Plant Growth”, Chris Thiele, May 29, 2018, Grobo Inc. website, each of which is incorporated by reference in its entirety.

[0118] The base **632** illustratively includes a reflective material on an upper surface thereof. In some embodiments, the base **632** may comprise a waterproof material.

[0119] Helpfully, this permits for conservation of water in several ways. Firstly, the integrated drip line passageway permits water to be deployed efficiently with minimal evaporation. Second, the reflective upper surface reduces the amount of thermal radiation absorbed by the ground area directly adjacent the root ball, permitting more moisture to be absorbed by the plant and not evaporated. Thirdly, the waterproof barrier also provides an additional water barrier, keeping moisture where it can be used. Also, the base **632** may prevent unintentional drift or runoff of pesticides or fertilizer applied around the base of the plant.

[0120] Moreover, the UV diffraction effect from the plurality of panels **634a-634c** may the improve growth rate of the plant. In particular, Applicant has observed a 20% increase in growth with the application of the plant cover device **630**. These enhanced growth benefits are in addition to the disease prevention purpose provided by the enclosure **631**, as discussed with regards to the earlier embodiments. Also, the base **632** also provides another barrier to disease spread by protecting the soil adjacent the root ball from insects.

[0121] Another aspect is directed to a method for making a plant cover device **630**. The method includes forming an enclosure **631** comprising a plurality of panels **634a-634c** coupled together to define a plant-receiving cavity therein. Each of the plurality of panels **634a-634c** has a major mesh surface **635a-635c**, and a seam **636a-636c** extending along a peripheral edge of the major mesh surface. Adjacent panels **634a-634c** are coupled together at respective seams. The enclosure **631** includes a first fastener **637** adjacent the peripheral edge of a respective panel **634b**. The method includes forming a base **632** coupled to the enclosure **631** and comprising a solid major surface **638** extending radially outward, and a second fastener **640** carried by the solid major surface and extending radially. The method further includes providing a support **633** to extend vertically from a ground surface to an apex of the enclosure **631**. The first fastener **637** and the second fastener **640**

are aligned and configured to provide access to the plant-receiving cavity.

[0122] Referring now additionally to FIGS. **24A-24C**, a plant cover device **730** is now described. In this embodiment of the plant cover device **730**, those elements already discussed above with respect to FIGS. **19-23** are incremented by 700 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **730** illustratively omits the base portion **632** of FIGS. **19-23**. This embodiment also includes a different structure for the support **733**. The support **733** illustratively includes a pole **750** extending from the ground surface, and a cap portion **752** coupled to an uppermost portion of the pole. The support **733** illustratively includes a plurality of arms **751a-751c** extending laterally from the cap portion **752** and configured to support the enclosure **731**.

[0123] As perhaps best seen in FIG. **24C**, the cap portion **752** illustratively includes a body **753** defining a lower recess configured to receive the uppermost portion of the pole **750**. The cap portion **752** illustratively includes a plurality of elbows **754a-754c** extending from the body **753** and respectively defining arm receiving passageways **755**. The arm receiving passageways **755** are configured to respectively receive the plurality of arms **751a-751c**.

[0124] In yet other embodiments (not shown), the support **733** may alternatively comprise a twisted arrangement of three (1 wire for each arm) or more wires configured to be anchored within the uppermost portion of the pole **750**. In particular, the wires would be formed into a twisted anchor inserted into the uppermost portion of the pole **750**. The other ends of the wires would extend laterally and straight fashion to support the enclosure **731**. The far distal ends of the wires would be curled downward to avoid tearing the mesh material of the plurality of panels **734a-734c**. Positively, this embodiment would be less costly to manufacture than the embodiment of FIGS. **24A-24C**.

[0125] Another embodiment of a plant cover device is now described. This embodiment differs from the previous embodiment in that this plant cover device illustratively comprises a trellis support structure. The trellis support structure illustratively includes a plurality of cross-shaped supports, each cross-shaped support having a ground support pole extending downward into a ground surface, first and second opposing arms extending laterally in opposite directions, and an upper arm extending upward substantially perpendicular (i.e.  $90^{\circ} \pm 20^{\circ}$ ) to the ground surface. Each of the arms comprises a distal tube, and a plurality of support cables (e.g. the illustrated three support cables) extending through the distal tubes.

[0126] Although not shown, the plurality of support cables are anchored to the ground surface at opposite ends of the plant cover device. The plant cover device illustratively includes a plurality of enclosures (e.g. the illustrated enclosure of FIGS. **19-22**) coupled to the plurality of support cables.

[0127] Another embodiment of a plant cover device is now described. This embodiment differs from the previous embodiment in that this plant cover device illustratively comprises support comprising a vertical support pole extending from a ground surface to an apex of the enclosure. The plant cover device illustratively comprises a circle-shaped support extending about externally the enclosure, and being coupled thereto.

[0128] Another embodiment of a plant cover device is now described. This embodiment differs from the previous embodiment in that this plant cover device illustratively comprises a support comprising a vertical support pole extending from a ground surface, and a cap portion coupled to an uppermost portion of the vertical support pole. The support illustratively includes a pair of arms extending opposite laterally and defining a figure-8 shape, i.e. a pair of opposing loops (e.g. substantially circle-shaped loops). The center point of the figure-8 shape extends through the cap portion. The enclosure is fitted over the support.

[0129] Another embodiment of a trellis structure support, is formed from a plurality of supports. The plurality of supports is aligned in a linear pattern to cover a plurality of plants. To define an enclosure, a mesh fabric is positioned over the plurality of supports. The plurality of supports is aligned arm-to-arm so that the arms are all collinear; and the plurality of supports is aligned so that

the arms are all parallel.

[0130] Another embodiment of a support is now described. This embodiment differs from the previous embodiment in that this support illustratively comprises a plurality of figure-8 shaped arm pairs positioned vertically on top of each other.

[0131] Another embodiment of a support is now described. This embodiment differs from the previous embodiment in that this support illustratively comprises a plurality of figure-8 shaped arm pairs positioned vertically on top of each other. In this embodiment, there are two pairs of figure-8 shaped arms.

[0132] Another embodiment of a support is now described. This embodiment differs from the previous embodiment in that this support illustratively comprises a vertical extending support anchored in the ground surface, and a loop-shaped arm extending from an uppermost portion of the support.

[0133] Another embodiment of a support is now described. This embodiment differs from the previous embodiment in that this support illustratively comprises a vertical extending support pole anchored in a ground surface, and a loop-shaped arm (e.g. the illustrated circle-shape) extending from an uppermost portion of the support. In this embodiment, the loop-shaped arm extends downward from the uppermost portion of the support.

[0134] Another embodiment of a plant cover device is now described. This embodiment differs from the previous embodiment in that this plant cover device illustratively comprises a support comprising a support pole extending from a ground surface, and an enclosure positioned over the uppermost portion of the pole. The support illustratively includes a plurality of arms extending opposite laterally. The distal ends of the plurality of arms are coupled to ends of the enclosure, and the plurality of arms extend in a cross shaped vertex directly above and coupled to the apex of the enclosure.

[0135] Another embodiment of a plant cover device is now described. This embodiment differs from the previous embodiment in that this plant cover device illustratively comprises an enclosure having a cone-shaped upper portion, and a cylinder-shaped lower portion. The cylinder-shaped lower portion illustratively comprises a sleeve extending along a bottom periphery thereof.

[0136] The enclosure illustratively includes a ring support (e.g. elastic fiberglass pole) extending in the sleeve about the periphery of a lowermost portion of the cylinder-shaped lower portion. The cone-shaped upper portion comprises a mesh material. The cylinder-shaped lower portion comprises a mesh portion, and an opaque portion (e.g. black colored material). The opaque portion serves a similar purpose to the base of the plant cover device **630** (FIGS. **19-22**) described hereinabove. Advantageously, the enclosure is easily fabricated from a single piece of material, which is fused together at peripheral edges via sewing, adhesive, or a heat gun, for example. The plant cover device illustratively includes a closure tying the cylinder-shaped lower portion to a trunk of the plant.

[0137] Another embodiment of a plant cover device is now described. This embodiment differs from the previous embodiment in that this plant cover device illustratively comprises an enclosure having a cone-shaped upper portion, and a cylinder-shaped lower portion. The cylinder-shaped lower portion illustratively comprises only a mesh material (i.e. the opaque portion is omitted).

[0138] Advantageously, these embodiments provide a greater ratio of enclosure volume to fabric area used than prior approaches. Moreover, in some embodiments, enclosure comprises a fastener (e.g. a zipper) extending from the lowermost portion of the enclosure to the apex thereof, which permits easy install and removal on larger plants.

[0139] It should be appreciated that any of the above features described above can be applied to the embodiments disclosed hereinbelow.

[0140] Referring now to FIGS. **25-27**, a plant cover device **1010** according to the present disclosure is now described. The plant cover device **1010** illustratively comprises an enclosure **1011** comprising an upper end **1012**, a lower tubular end **1013** opposite the upper end, and a medial seam

**1014** coupling the upper end and the lower tubular end.

[0141] The upper end **1012** illustratively includes a plurality of panels **1015a-1015d** coupled together to partially define a plant-receiving cavity therein. Each of the plurality of panels **1015a-1015d** has a major mesh surface, and a panel seam extending along a peripheral edge of the major mesh surface. Adjacent panels **1015a-1015d** are coupled together at respective panel seams. For example, the medial seam **1014** and the panel seams may each comprise stitched seams, adhesive seams, or fused seams (i.e. using a heat gun to fuse adjacent portions of the panels **1015a-1015d**).

[0142] In the illustrated embodiment, the enclosure **1011** has four faces **1030a-1030d**. In other embodiments, the enclosure **1011** may include a different number of faces, for example, three faces.

[0143] The lower tubular end **1013** illustratively comprises a major mesh surface and has a first end **1016** and a second end **1017** opposite the first end. The first end **1016** is coupled to the medial seam **1014**. The lower tubular end **1013** also partially defines the plant-receiving cavity therein, illustrated with a plant **1026** for illustrative clarity.

[0144] The enclosure **1011** illustratively comprises a curved flexible support **1020** carried by the medial seam **1014**. The curved flexible support **1020** may comprise a loop-shaped support, for example. In some embodiments, the loop-shaped support may have a circle or oval shape. The curved flexible support **1020** may comprise a single piece flexible rod in some embodiments. In other embodiments, the curved flexible support **1020** may comprise a plurality of segments coupled together.

[0145] In some embodiments, the curved flexible support **1020** comprises fiberglass, which is flexible yet resilient enough to return to the original shape (i.e. a memoryless material). The curved flexible support **1020** may alternatively comprise flexible metallic wire. This embodiment is advantageous for at least the following reasons. The curved flexible support **1020** may be folded over temporarily for shipping, which allows for efficient transport and retail packaging. Additionally, once deployed in the field, the curved flexible support **1020** can withstand adverse weather conditions and return to the original shape.

[0146] As perhaps best seen in FIG. 26B, the medial seam **1014** illustratively includes an outer mesh piece **1028**, and an annular sleeve **1027** coupled to the outer mesh piece. The curved flexible support **1020** is carried within the annular sleeve **1027**. In this embodiment, the annular sleeve **1027** is carried internally within the plant-receiving cavity, but in other embodiments, the annular sleeve **1027** may be carried externally. In some embodiments, the annular sleeve **1027** is radially contiguous about the medial seam **1014**. In other embodiments, the annular sleeve **1027** may comprise one or more openings for installation of the curved flexible support **1020** by a user.

[0147] The enclosure **1011** illustratively comprises a pole **1021** extending vertically from a surface **1018** to an apex of the enclosure. In some embodiments, the surface **1018** comprises a ground surface, but may also comprise a potted soil surface (e.g. tower garden applications).

[0148] As perhaps best seen in FIG. 25, each of the plurality of panels **1015a-1015d** comprises a pentagon-shaped panel. Each of the plurality of panels **1015a-1015d** comprises a triangle-shaped section **1022a-1022d**, and a rectangle shaped section **1023a-1023d** coupled to the triangle-shaped section. The respective triangle-shaped sections **1022a-1022d** of the plurality of panels **1015a-1015d** define the apex of the enclosure **1011** and an uppermost portion of the plant-receiving cavity.

[0149] In the illustrated embodiment, the second end **1017** of the lower tubular end **1013** comprises a solid section **1024** at a lowermost end of the lower tubular end. The solid section **1024** is opaque to visible light radiation and waterproof. In some applications, the lowermost portion of the solid section **1024** is coupled to the surface **1018** via a plurality of stakes, for example. In some embodiments, the solid section **1024** may comprise a reflective material.

[0150] Advantageously, when the plant cover device **1010** is used in field applications, the solid section **1024** provides shade around the root ball. The shade is helpful for a couple of reasons: the permanent shade kills weeds, and the permanent shade reduces evaporation of water applied to the

root ball (e.g. from low flow irrigation systems, such as drip lines). Moreover, the waterproof feature further reduces evaporation of the applied water. Also, the solid section **1024** provides a thermal insulation barrier, retaining ground thermal energy when the ambient temperature drops. [0151] The second end **1017** of the lower tubular end **1013** illustratively includes a drawstring **1025** coupled at a lowermost end of the lower tubular end. In some applications, the drawstring **1025** is used to bind the solid section **1024** to a trunk of the plant, sealing in the plant-receiving cavity. [0152] Each mesh surface of the enclosure **1011** comprises a plurality of mesh openings, each opening having a diameter of less than 300  $\mu\text{m}$ . As will be appreciated, this mesh size is sufficient to provide a barrier to Asian citrus psyllid, and therefor citrus greening disease transmission. It should be appreciated that the upper and side portions of the enclosure **1011** are sealed to provide a proper barrier to insects.

[0153] As perhaps best seen in FIG. 27, the method of assembly of the enclosure **1011** is shown, which begins with several flat mesh pieces. The lower tubular end **1013** is formed from a single strip of mesh material. Each of the plurality of panels **1015a-1015d** is formed from a custom cut mesh piece in the illustrated pentagon shape. Subsequently, the four panel pieces are coupled to the single strip of mesh material via the medial seam **1014a-1014d** to define four faces **1030a-1030d** for the enclosure **1011**. At this point, the mesh piece is arranged in tubular form and opposing ends **1031a-1031b** of the mesh piece are coupled together at a longitudinal seam. Then, the triangle-shaped sections **1022a-1022d** are coupled together to define the apex of the plant-receiving cavity. [0154] Another aspect is directed to a method of making a plant cover device **1010**. The method includes forming an enclosure **1011** comprising an upper end **1012**, a lower tubular end **1013** opposite the upper end, and a medial seam **1014** coupling the upper end and the lower tubular end. The upper end **1012** includes a plurality of panels **1015a-1015d** coupled together to partially define a plant-receiving cavity therein. Each of the plurality of panels **1015a-1015d** has a major mesh surface, and a panel seam extending along a peripheral edge of the major mesh surface. Adjacent panels **1015a-1015d** are coupled together at respective panel seams. The lower tubular end **1013** comprises a major mesh surface and have a first end **1016** and a second end **1017** opposite the first end, the first end being coupled to the medial seam **1014**. The lower tubular end **1013** also partially defines the plant-receiving cavity therein. The enclosure **1011** comprises a curved flexible support **1020** carried by the medial seam **1014**. The method comprises providing a pole **1021** to extend vertically from a surface **1018** to an apex of the enclosure **1011**.

[0155] Referring now to FIG. 28, a plant cover device **1100** is now described. As will be appreciated, this plant cover device **1100** is intended for row crop applications (i.e. a long line of plants **1101** are planted in a near linear path). Of course, the plant cover device **1100** can be used in other applications. The plant cover device **1100** illustratively comprises a spreader device **1108**, and a mesh **1107** over the spreader device. As will be appreciated, the mesh **1107** is comprises a mesh piece long enough to extend between ends of a row crop segment. For drawing clarity, only one plant **1101** is illustrated, but it should be appreciated that the row may comprise a large number of plants.

[0156] The spreader device **1108** illustratively comprises a support **1102** extending from a ground surface **1110**, a bracket **1103** coupled to an uppermost portion of the support, and a pair of support arms **1104a-1104b** extending from the bracket. The mesh **1107** comprises a major mesh surface **1105** extending over the top of the plant **1101** and substantially down the longitudinal sides, and solid sections **1106a-1106b** coupled to the major mesh surface and adjacent the ground surface **1110**. The solid sections **1106a-1106b** may be anchored to the ground surface **1110** and provide the same benefits as noted above for the embodiment of the plant cover device **1010** of FIG. 25. Although not shown, the plant cover device **1010** illustratively comprises a coupling (e.g. a zip tie) between the major mesh surface **1105** and the bracket **1103**.

[0157] As will be appreciated, the pair of support arms **1104a-1104b** is to support and abut the mesh **1107**. In particular, the pair of support arms **1104a-1104b** is intended to prevent the major

mesh surface **1105** from resting on the plant **1101**.

[0158] Referring now additionally to FIG. **29**, another embodiment of the plant cover device **1200** is now described. In this embodiment of the plant cover device **1200**, those elements already discussed above with respect to FIG. **28** are incremented by 100 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **1200** illustratively includes a spreader device **1208** comprising a plurality of brackets **1203a-1203c**, and a plurality of support arm pairs **1204a-1204f** coupled respectively to the plurality of brackets. The plurality of support arm pairs **1204a-1204f** is vertically aligned.

[0159] Helpfully, in this embodiment of the plant cover device **1200**, the plant cover device **1200** may cover two rows of the plants **1201a-1201b**. It should be appreciated that the multiple bracket features of the plant cover device **1200** can be readily applied to the plant cover device embodiments of FIGS. **30-32**. Also, in some embodiments, the support **1207** may comprise a single piece where the brackets **1203a-1203c** fit or slide thereover, but in other embodiments, the support may comprise a plurality of segments, and the brackets also couple the segments together.

[0160] Referring now additionally to FIG. **30**, another embodiment of the plant cover device **1300** is now described. In this embodiment of the plant cover device **1300**, those elements already discussed above with respect to FIG. **28** are incremented by 200 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **1300** illustratively includes the plurality of spreader devices **1308a-1308d** arranged laterally. Here, adjacent support arms **1304b-1304c** from adjacent spreader devices **1308a-1308b** flank respective plants **1301a**. Also, the plurality of support arm pairs **1304a-1304h** is arranged substantially parallel (i.e.  $\pm 20^\circ$  of parallel) to the row of plants **1401a-1401c**.

[0161] Referring now additionally to FIG. **31**, another embodiment of the plant cover device **1400** is now described. In this embodiment of the plant cover device **1400**, those elements already discussed above with respect to FIG. **28** are incremented by 300 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **1400** illustratively includes the plurality of spreader devices **1408a-1408d** arranged interspersed between the plants **1401a-1401c**. Also, the plurality of support arm pairs **1404a-1404h** is arranged substantially orthogonal (i.e.  $\pm 20^\circ$  of  $90^\circ$ ) to the row of plants **1401a-1401c**.

[0162] Referring now additionally to FIG. **32**, another embodiment of the plant cover device **1500** is now described. In this embodiment of the plant cover device **1500**, those elements already discussed above with respect to FIG. **28** are incremented by 400 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **1500** illustratively includes the plurality of spreader devices **1508a-1508b** arranged laterally. Here, adjacent support arms **1504a-1504d** are aligned over respective plants **1501a-1501d**. Also, the plurality of support arm pairs **1504a-1504d** are arranged substantially parallel (i.e.  $\pm 20^\circ$  of parallel) to the row of plants **1501a-1501d**.

[0163] Referring now additionally to FIG. **33**, another embodiment of the plant cover device **1600** is now described. In this embodiment of the plant cover device **1600**, those elements already discussed above with respect to FIG. **28** are incremented by 500 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **1600** illustratively includes a spreader device **1608** comprising a plurality of brackets **1603a-1603b**, and a plurality of support arm pairs **1604a-1604d** coupled respectively to the plurality of brackets. The plurality of support arm pairs **1604a-1604d** is vertically aligned.

[0164] Helpfully, in this embodiment of the plant cover device **1600**, the plant cover device **1600** may cover two rows of the plants **1601a-1601b**. This plant cover device **1600** illustratively includes a coupling **1640** (e.g. zip tie, tether, wire) at an uppermost portion of the support **1602** for anchoring the mesh **1607** to the support. In this embodiment, the uppermost support arm pair **1604a-1604b** abuts and supports the mesh **1607** and prevents it from resting on the plants **1601a-1601b**. The lowermost support arm pair **1604c-1604d** also abuts and supports the mesh **1607** and



prevents it from resting on the plants **1601a-1601b**.

[0165] Referring now additionally to FIG. **34**, another embodiment of the plant cover device **1700** is now described. In this embodiment of the plant cover device **1700**, those elements already discussed above with respect to FIG. **33** are incremented by 100 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **1700** illustratively includes the support **1702** anchored in a pot **1741**. The lowermost portion of the mesh **1707** is coupled to the pot **1741** via a coupling **1742** (e.g. zip tie, tether, wire).

[0166] Referring now additionally to FIG. **35**, another embodiment of the plant cover device **1800** is now described. In this embodiment of the plant cover device **1800**, those elements already discussed above with respect to FIG. **30** are incremented by 400 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **1800** illustratively includes respective supports **1802a-1802d** extend further upward, and respective couplings **1840a-1840d** at uppermost portions of the supports for coupling the supports to the mesh **1807**.

[0167] In the plant cover device **1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800** embodiments of FIGS. **28-35**, the support arm pairs not only support the mesh structure, but also provide support for the plants themselves. Moreover, these plant cover device **1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800** embodiments can be used without the mesh **1207, 1307, 1607, 1707, 1807** and simply to support the plants.

[0168] Referring now additionally to FIGS. **36-37**, another embodiment of the plant cover device is now described. This embodiment also illustratively includes solid sections coupled to the major mesh surface and adjacent the ground surface, but differs from the previous embodiment in that this plant cover device also includes a solid base member covering the ground surface about the plant. The solid base member is coupled to the solid sections at the periphery thereof.

[0169] As perhaps best seen in FIG. **37A**, the solid base member illustratively comprises a major surface, first and second seams extending transversely across the major surface, and an annular section at a periphery of the major surface. The first and second seams may each comprise a closable fastener, for example, a hook and loop fastener, a zipper fastener, or a grommet fastener. The annular section may comprise an annular groove for receiving a flexible support member therein, thereby maintaining proper extension and ground cover. In other embodiments, the annular section may comprise an irrigation device, such as a soaker hose for providing direct irrigation to the plant. Although the solid base member is illustratively circle-shaped, the solid base member may have other shapes, such as an oval or a rectangle.

[0170] As will be appreciated, the plant cover device is installed over the plant with the following steps. The first and second seams are opened, and this open end is fitted over the plant and the support. Once the plant cover device is in place, the first and second seams are closed, and the annular section is optionally anchored to the ground surface.

[0171] The major surface comprises an optically opaque solid section, and may also be partially or completely water proof. Advantageously, the plant cover device may provide for improved weed barrier since only controlled irrigation via the annular section is permitted. Helpfully, this may permit growers to avoid direct application of herbicides to the plant and only apply the herbicides between rows of plants, i.e. a method of reducing herbicide application. The major surface may alternatively comprise a water permeable surface in some embodiments.

[0172] In some embodiments, the major mesh surface may comprise a single different color, a combination of colors, or a reflective material to affect growth behavior of the plant, providing for increased growth, increased flowering, and stunting, etc. Moreover, the use of the plant cover device may provide for a method for increased or improved carbon sequestration ability or efficiency of the plant. The use of the plant cover device may provide for a method of growing cannabis in an open environment while protecting the integrity of a strain and or improving the internal and external quality. Here, the complete enclosure of the plant by the plant cover device

ensures integrity of the cannabis. The use of the plant cover device may provide for a method of increasing agriculture productivity, increasing food security, promotion of urban agriculture, and increasing societal access stability to a secure food source by using in combination with a tower garden or other like vertical growing techniques.

[0173] The use of the plant cover device may provide for a method of increasing the nutrient/phytochemical levels in the plant, such as sugars, terpenes, flavonoids, vitamins, hormones, etc. The use of the plant cover device may provide for a method of increasing the growth rate and photosynthetic efficiency of the plant. The use of the plant cover device may provide for a method of increasing the self-defense mechanism of the plant. The use of the plant cover device may provide for a method of reducing nutrient or pesticide run-off or leaching into waterways and extending the useful life of fertilizers and pesticides by the same mechanism. In some embodiments, the major mesh surface may be replaced with non-permeable material to create a greenhouse effect and allow for earlier planting activity in colder climates.

[0174] Referring now additionally to FIG. 38, another embodiment of the plant cover device is now described. This embodiment also differs from the previous embodiment in that this plant cover device also includes the major surface having a water permeable surface. Here, a growth material (e.g. soil, water absorbent material) can be placed within the lower tube-shaped recess defined by the solid base member and the solid sections. Here, the plant would be positioned within the growth material, completely sequestering the plant from weeds and insects. For these embodiments, the major mesh surface would include another closable seam for allowing placement of the growth material.

[0175] Referring now additionally to FIG. 39, another embodiment of the plant cover device is now described. This embodiment also differs from the previous embodiment in that this plant cover device is used in a tower garden application.

[0176] Referring again to FIGS. 36 & 37A-37B, an IPC device **1900** according to the present disclosure is now described. The IPC device **1900** illustratively includes a pole **1901** in a ground surface **1902**. The pole **1901** may comprise a hollow tube, or a solid pole. For example, the pole may comprise a polymer plastic material, such as PVC, or a fiberglass composite material.

[0177] The IPC device **1900** also includes an upper end **1903**, and a lower tubular end **1904** opposite the upper end. The upper end **1903** and the lower tubular end **1904** collectively define a plant-receiving cavity **1905** for receiving a plant **1906**. The upper end **1903** illustratively includes tapered walls **1907a-1907b** extending inwardly from a base **1910** and into an apex **1911** to abut the pole **1901**, and a seam **1912** extending along a peripheral edge of the tapered walls. Each tapered wall **1907a-1907b** comprises a major mesh surface, and the major mesh surface may cover the entirety of a given tapered wall or a portion of the tapered wall. The seam **1912** illustratively extends vertically between the base **1910** and the apex **1911**, but may additionally or alternatively extend laterally to patch together multiple panels of mesh material.

[0178] As will be appreciated, the seam **1912** couples together the tapered walls **1907a-1907b** to form a contiguous barrier against insects and other creatures. The seam **1912** may comprise stitching, adhesive material binding, or thermal mechanical coupling in plastic mesh embodiments.

[0179] The lower tubular end **1904** illustratively comprises a first end **1913**, a second end **1914** opposite the first end, and a major mesh surface extending between the first end and the second end. The major mesh surface may cover the entirety of the lower tubular end **1904** or a portion of the lower tubular end. The IPC device **1900** also includes a medial seam **1915** coupling the base **1910** of the upper end **1903** and the first end **1913** of the lower tubular end **1904**. The medial seam **1915** illustratively includes an annular sleeve **1918** defining a passageway. The IPC device **1900** also includes a curved flexible support **1916** carried by the medial seam **1915** within the annular passageway. The curved flexible support **1916** may comprise a memoryless flexible material. As will be appreciated, the memoryless flexible material comprises a material that is flexible, but returns to an original state when deformed. For example, the memoryless flexible material

comprises a fiberglass rod.

[0180] The IPC device **1900** also includes a base member **1917** coupled to the second end **1914** of the lower tubular end **1904** and extending inwardly and transversely to the lower tubular end and to cover the ground surface **1902** adjacent the pole **1901**. The lower tubular end **1904** comprises a vertically extending fastener **1920** for permitting access to the plant-receiving cavity **1905**. For example, the vertically extending fastener **1920** may comprise a zipper fastener.

[0181] In the illustrated embodiment, the second end **1914** of the lower tubular end **1904** comprises a solid section **1921**. In other words, the major mesh surface extends from the first end **1913** only partially to the second end **1914**. For example, the solid section **1921** may comprise between 10% and 50% of the height of the lower tubular end **1904**. In particular, the solid section **1921** comprises an opaque material that does not permit transmission of visible electromagnetic radiation. In some embodiments, the solid section **1921** may comprise a material that is water proof, thereby forming a moisture barrier. For example, the solid section **1921** may comprise a colored polymer solid section (e.g. red, black). In particular, the solid section **1921** can be used to block/contain/restrict the irrigation water however permeable enough to allow for the water to permeate through to the plant roots. Also, the solid section **1921** and the base member **1917** are enough to act as a weed barrier however still let water through. Also, the different colors can promote different things, such as white provides cooling effect, black provides warming effect, and red provides for increased growth. In other embodiments, the solid section **1921** may comprise a material that is water permeable.

[0182] Also, it should be appreciated that the vertical height of the solid section **1921** is substantially consistent for the entirety of the lower tubular end **1904** (i.e. forming a tube of the solid material). The solid section **1921** may comprise reflective material on one or both of the inner surface facing the plant **1908** and the outer surface facing away from the plant.

[0183] The base member **1917** comprises a small central opening **1931** for permitting the passing through of the pole **1901**. In some embodiments, the base member **1917** may include first and second radial slit **1932a-1932b** extending between opposite ends of the second end **1914** of the lower tubular end **1904**. At the periphery of the base member **1917**, the second end **1914** of the lower tubular end **1904** includes an annular groove **1919** for receiving another curved flexible support or a drip hose line for irrigation.

[0184] As shown in FIGS. **36-37B**, the base member **1917** also comprises a major surface **1928**, and the major surface may comprise a solid section constituted similarly to the solid section **1921** of the lower tubular end **1904**. The solid section of the base member **1917** may cover an entirety of the base member or a portion thereof. As will be appreciated, this combination provides for a bottom tubular container comprising solid material.

[0185] The IPC device **1900** illustratively includes a plurality of spreader devices **1922-1923** coupled to the pole **1901** and extending into the upper end **1903** and the lower tubular end **1904**. Each spreader device **1922-1923** includes a bracket **1924, 1925**, and first and second opposing loops **1926a-1926b, 1927a-1927b** coupled to the bracket. The brackets **1924-1925** are coupled to the pole **1901**. In some embodiments, the bracket **1924, 1925** is omitted and the first and second opposing loops **1926a-1926b, 1927a-1927b** are coupled to the pole **1901** directly. In some embodiments, the pole **1901** comprises lateral openings receiving and passing the first and second opposing loops **1926a-1926b, 1927a-1927b** therethrough. In some embodiments, the first and second opposing loops **1926a-1926b, 1927a-1927b** each comprises the same memoryless flexible material from the curved flexible support **1916**.

[0186] The IPC device **1900** illustratively includes a cap coupling **1930** (e.g. zip tie, tether, wire) at an uppermost portion of the pole **1901** for anchoring the apex **1911** of the upper end **1903** to the pole. As will be appreciated, this anchors the IPC device **1900** and prevents it from moving with the wind, potentially damaging the plant **1906**. In the illustrated embodiment, the cap coupling **1930** does not impact the structural seal of the IPC device **1900**. The plant-receiving cavity **1905** is

sealed and protected from insect intrusion.

[0187] In some embodiments, the IPC device **1900** may include a detachable coupling (e.g. hook and loop fastener, zipper fastener) between the second end **1914** of the lower tubular end **1904** and the first end **1913** of the lower tubular end. The detachable coupling may be positioned at the upper end of the solid section **1921**, for example. Here, the plant **1906** can be nurtured in the seedling stage within a fully enclosed IPC device **1900**. After the plant **1906** reaches a threshold growth level, the first end **1913** of the lower tubular end **1904** and the upper end **1903** are removed, and the second end **1914** of the lower tubular end **1904** remains. The remaining structure would be similar to the embodiment of FIG. **42**, and may include features therefrom.

[0188] Another aspect is directed to a method for making an IPC device **1900**. The method also includes forming an upper end **1903** comprising tapered walls **1907a-1907b** extending inwardly from a base **1910** and into an apex **1911** to abut a pole **1901**, and a seam **1912** extending along a peripheral edge of the tapered walls. Each tapered wall **1907a-1907b** comprises a major mesh surface, and the upper end **1903** defines a plant-receiving cavity **1905** therein. The method also includes forming a lower tubular end **1904** opposite the upper end **1903** and comprising a first end **1913**, a second end **1914** opposite the first end, and a major mesh surface extending between the first end and the second end. The lower tubular end **1904** also defines the plant-receiving cavity **1905** therein. The method also includes coupling the base **1910** of the upper end **1903** and the first end **1913** of the lower tubular end **1904** with a medial seam **1915**. The method also includes positioning a curved flexible support **1916** to be carried by the medial seam. The method also includes coupling a base member **1917** to the second end **1914** of the lower tubular end **1904** and extending inwardly and transversely to the lower tubular end and to cover a ground surface **1902** adjacent the pole **1901**.

[0189] Another aspect is directed to a method for installing an IPC device **1900**. The IPC device **1900** comprises an upper end **1903** comprising tapered walls **1907a-1907b** extending inwardly from a base **1910** and into an apex **1911** to abut a pole **1901**, and a seam **1912** extending along a peripheral edge of the tapered walls. Each tapered wall **1907a-1907b** comprises a major mesh surface. The upper end **1903** defines a plant-receiving cavity **1905** therein. The IPC device **1900** also includes a lower tubular end **1904** opposite the upper end **1903** and comprising a first end **1913**, a second end **1914** opposite the first end, and a major mesh surface extending between the first end and the second. The lower tubular end **1904** also defines the plant-receiving cavity **1905** therein. The IPC device **1900** also comprises a medial seam **1915** coupling the base **1910** of the upper end **1903** and the first end **1913** of the lower tubular end **1904**, a curved flexible support **1916** carried by the medial seam, and a base member **1917** coupled to the second end **1914** of the lower tubular end and extending inwardly and transversely to the lower tubular end. The method also includes positioning the IPC device **1900** over a plant **1906** and a pole **1901** adjacent the plant in a ground surface **1902**, and positioning the base member **1917** to cover the ground surface adjacent the pole.

[0190] Referring now additionally to FIG. **38**, another embodiment of the IPC device **2000** is now described. In this embodiment of the IPC device **2000**, those elements already discussed above with respect to FIGS. **36-37B** are incremented by 100 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this IPC device **2000** illustratively includes a growing medium **2040** (e.g. soil, coco coir) within a lowermost portion of the lower tubular end **2004**.

[0191] Referring now additionally to FIGS. **39-40**, another embodiment of the IPC device **2100** is now described. In this embodiment of the IPC device **2100**, those elements already discussed above with respect to FIGS. **36-37B** are incremented by 200 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this IPC device **2100** illustratively includes a plurality of growing medium containers **2150a-2150c** coupled to the pole **2101**.

[0192] Each of the plurality of growing medium containers **2150a-2150c** includes a body, a growing medium carried by the body, and a plurality of plants **2106a-2106b** therein. The growing medium may comprise one or more of soil, water absorbent rock material, and compacted coconut material (i.e. coco coir). In some embodiments, the body may comprise a pot container coupled to the pole **2101** with an open upper end for plant growth. In other embodiments, the body may comprise a flexible bag (e.g. polymer plastic bag) coupled to the pole **2101** having a plurality of slits therein for permitting the plurality of plants **2106a-2106b** to extend and grow therethrough.

[0193] The pole **2101** illustratively includes a plurality of openings **2151a-2151d** therein and aligned with the plurality of growing medium containers **2150a-2150c**. As will be appreciated, the pole **2101** includes an open top end, the plurality of plants **2106a-2106b** may be watered by adding nutrient enriched water into the pole **2101** from the open top end. Although not shown, the pole **2101** includes a liquid bottom stop below the plurality of openings **2151a-2151d**. The nutrient enriched water will flow out of the plurality of openings **2151a-2151d** and into the plurality of growing medium containers **2150a-2150c**.

[0194] Referring now additionally to FIGS. **41A-41B**, a spreader device **2222** is now described. The spreader device **2222** includes a bracket **2224**, and first and second opposing loops **2226a-2226b** coupled to the bracket. The bracket **2224** illustratively includes a tubular housing **2260** receiving the first and second opposing loops **2226a-2226b**, and a retention arm **2261** coupled to the tubular housing. The retention arm **2261** illustratively comprises a retention clip for attaching to a pole.

[0195] Referring now additionally to FIG. **42**, another embodiment of the IPC device **2300** is now described. In this embodiment of the IPC device **2300**, those elements already discussed above with respect to FIGS. **36-37B** are incremented by 400 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this IPC device **2300** illustratively includes no upper end. The IPC device **2300** encompasses a plant **2306**, and an irrigation sprinkler **2371**.

[0196] The IPC device **2300** includes a base member **2317**, and tubular walls **2370a-2370b** extending upward from the periphery of the base member. The tubular walls **2370a-2370b** include a spiral sleeve extending from a bottom end adjacent the base member **2317** to an upper end, and a flexible support member extending through the spiral sleeve to maintain the tubular walls upright. The base member **2317** and the tubular walls **2370a-2370b** comprise solid material sections. The tubular walls **2370a-2370b** comprise an outer wall facing away from the plant **2306**, and an inner wall facing towards the plant. Each of the inner wall and the outer wall may comprise a reflective section (i.e. reflective of visible electromagnetic radiation) or an absorbing section (e.g. black surface). Similar to the embodiments of FIGS. **36-37B**, the base member **2317** may include first and second radial slit extending between opposite ends for permitting the IPC device **2300** to be fitted over the plant.

[0197] As shown, the IPC device **2300** may prevent water waste from the irrigation sprinkler **2371**. In some embodiments, this IPC device **2300** may also include an annular sleeve about the periphery for receiving an irrigation drip line therethrough. In large scale crop applications including a line of plants and respective IPC devices **2300** for each plant, there may be a water supply line for each row, and a plurality of irrigation drip line respectively coupled to the IPC devices **2300**.

[0198] Helpfully, the IPC device **1900, 2000, 2100, 2300** may also function as a method of irrigation and fertilizer reduction when used in conjunction with low volume, micro-sprinklers, conventional, or drip irrigation methods by containing the water within the IPC device. This also may reduce evaporative loss, wind diffusion, and excess spray pattern outside of the root zone. This may reduce excess nutrient runoff into surrounding aquatic environments.

[0199] The IPC devices **1900, 2000, 2100, 2300** also may provide increased cold/freeze protection. The IPC devices **1900, 2000, 2100, 2300** may also increase a plant's ability to sequester/remove carbon from the atmosphere by increasing the plant's photosynthetic efficiency/activity. This

function may be important as a method to combat climate change as well as adding value to a crop by increasing the possible carbon credits that can be obtained. The IPC devices **1900, 2000, 2100, 2300** can increase the phytochemicals in a plant resulting increased value and usefulness of the plant for spices, medicinal components, etc.

[0200] Referring now additionally to FIGS. **43-45**, a plant cover device **2430** is now described. In this embodiment of the plant cover device **2430**, those elements already discussed above with respect to FIGS. **19-23** are incremented by 2400 and most require no further discussion herein. This embodiment differs from the previous embodiment in that this plant cover device **2430** illustratively comprises a trellis support structure **2433**. The trellis support structure **2433** illustratively includes a plurality of cross-shaped supports, each cross-shaped support having a ground support pole extending downward into a ground surface, first and second opposing arms extending laterally in opposite directions, and an upper arm extending upward substantially perpendicular (i.e.  $90^{\circ} \pm 24^{\circ}$ ) to the ground surface. Each of the arms comprises a distal tube, and a plurality of support cables (e.g. the illustrated three support cables) extending through the distal tubes.

[0201] Although not shown, the plurality of support cables are anchored to the ground surface at opposite ends of the plant cover device **2430**. As perhaps best seen in FIGS. **44-45**, the plant cover device **2430** illustratively includes a plurality of enclosures **2431a-2431c** (e.g. the illustrated enclosure **631** of FIGS. **19-22**) coupled to the plurality of support cables.

[0202] It should be appreciated that the individual features from any of the above embodiments are combinable with other embodiments disclosed herein.

Many modifications and other embodiments of the present disclosure will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is understood that the present disclosure is not to be limited to the specific embodiments disclosed, and that modifications and embodiments are intended to be included within the scope of the appended claims.

## Claims

1. An individual plant cover (IPC) device for a plant in a pot, the IPC device comprising: a support to be positioned in a soil surface of the pot adjacent to the plant and extending upward from the soil surface; a mesh surface enclosure comprising an upper end with a sealed apex, and a lower end to surround the pot, the mesh surface enclosure defining a plant-receiving cavity therein, the mesh surface enclosure having a mesh size to prevent intrusion by psyllids and aphids; and at least one spreader device coupled to the support and configured to extend outward to the mesh surface enclosure.
2. The IPC device of claim 1 further comprising a first coupling device to wrap around the lower end and configured to cause the lower end to abut the pot.
3. The IPC device of claim 2 further comprising a second coupling device to wrap around the upper end and configured to cause the upper end to abut the support.
4. The IPC device of claim 3 wherein each of the first coupling device and the second coupling device comprises one of a zip tie, a tether, and a wire.
5. The IPC device of claim 1 wherein the at least one spreader device comprises first and second opposing loops coupled to the support.
6. The IPC device of claim 1 wherein the at least one spreader device comprises a plurality of spreader devices to be coupled to the support.
7. The IPC device of claim 1 wherein the mesh surface enclosure comprises a plurality of panels coupled together at respective panel seams.
8. The IPC device of claim 1 wherein the upper end is cone-shaped.
9. The IPC device of claim 1 wherein the mesh size of mesh surface enclosure provides for water

permeability and light transmissivity.

**10.** A plant cover assembly for a row of plants, the plant cover assembly comprising: a plurality of individual plant cover (IPC) devices respectively arranged over the row of plants, each IPC device comprising a mesh surface enclosure comprising an upper end with a sealed apex, and a lower end to surround a respective plant, the mesh surface enclosure defining a plant-receiving cavity therein, the mesh surface enclosure having a mesh size to prevent intrusion by psyllids and aphids; first and second supports respectively at first and second ends of the row of plants; and at least one wire sequentially being coupled to the first support, the plurality of IPC devices, and the second support.

**11.** The plant cover assembly of claim 10 wherein each of the first support and the second support comprises a mast extending from a ground surface, and first and second arms extending laterally from the mast.

**12.** The plant cover assembly of claim 11 wherein the at least one wire comprises a first wire, a second wire, and a third wire respectively coupled to a distal end of the first arm, a distal end of the second arm, and the mast.

**13.** The plant cover assembly of claim 12 wherein the third wire is coupled to the sealed apex of each of the plurality of IPC devices.

**14.** A plant cover assembly for a row of plants, the plant cover assembly comprising: a plant cover device arranged over the row of plants and having a mesh surface, the plant cover device comprising an upper end with a sealed apex, and a lower end to surround lowermost portions of plants in the row of plants, the mesh surface having a mesh size to prevent intrusion by psyllids and aphids; first and second supports respectively at first and second ends of the row of plants; and a plurality of spreader devices arranged within the row of plants, each spreader device to extend to the plant cover device.

**15.** The plant cover assembly of claim 14 wherein each spreader device comprises a support extending from a ground surface, a bracket coupled to an uppermost portion of the support, and a pair of support arms extending from the bracket.

**16.** The plant cover assembly of claim 14 wherein each spreader device comprises a support extending from a ground surface, a plurality of brackets coupled to the support, and a plurality of support arm pairs respectively extending from the plurality of brackets.

**17.** The plant cover assembly of claim 16 wherein the plurality of brackets is vertically aligned.

**18.** The plant cover assembly of claim 16 wherein each of the plurality of support arm pairs is arranged to be transverse to the row of plants.

**19.** The plant cover assembly of claim 16 wherein the lower end comprises a solid section.

**20.** The plant cover assembly of claim 16 wherein the lower end is anchored to a ground surface.

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