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(54) Invention Name

Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn

(57) Abstract

Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn relates to the cultivation field, characterized in that it comprises the following steps: (1) determination of fertilizer ratio in the early stage and completion of the following treatments; (2) orchard preparation; (3) application of base fertilizer; (4) tuber treatment; (5) determination of row spacing and seed sowing; (6) ridging; (7) field management; and (8) harvesting. This method used for potato cultivation could achieve balanced reproduction of beneficial bacteria and inhibit the growth of harmful cenobium in the soil; the specially formulated fertilizers can enhance the strong seedling, early tuberization, thick stems, thriving growth and high yields of potatoes while focusing on preventing potato diseases such as early blight and late blight; this method results in higher yields and better quality of potatoes compared to traditional cultivation modes. Furthermore, it can preserve the land and basically eliminate diseases for continuous cropping. In particular, after the orchard moves beyond the young stage, the growth of seedlings in the orchard is more thriving than that with other interplanting methods.

1. Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn is characterized in that it comprises the following steps:

(1) Determination of fertilizer ratio in the early stage and completion of the following treatments: Mix pig manure, husks, humic acid liquid fertilizer, and humic acid powdery fertilizer thoroughly, seal the mixture in a plastic bag for retting, ensuring to flip it at least once, and maintain the sealed condition for retting to occur;

(2) Orchard Preparation: Remove the weed between the rows of fruit trees in the young orchard from late August to mid-September, and start deep plowing to a depth of at least 0.4m in some no less than 0.5m away from the young fruit tree seedlings on either side;

(3) Application of Base Fertilizer: Apply the base fertilizers in parallel with the deep plowing, and the base fertilizers include thoroughly decomposed farmyard manure and the NPK compound fertilizer stated in Step (1). Fully mix the fertilizers with the deeply plowed soil, and rake the soil;

(4) Tuber Treatment: Transform the potatoes into tubers, each containing bud pits, apply humic acid liquid fertilizer in these tubers and dry them in the air during the cultivation process;

(5) Determination of Row Spacing and Seed Sowing: Arrange the row spacing as 0.4-0.5m, and plant the tubers treated in Step (4) at the center line;

(6) Ridging: Turn the soil in the ditches on both sides of the tuber rows, and use the turned soil to cover the tubers at a thickness of not exceeding 10cm;

(7) Field Management: Apply additional NPK compound fertilizer per mu once and spray humic acid aqueous solution on the foliage in mid to late October;

(8) Harvesting: Harvest the potatoes from mid-December to early January.

2. Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn according to Claim 1, characterized in that: the said humic acid liquid fertilizer and humic acid powdery fertilizer in Step (1) and the humic acid liquid in Step (7) are produced by KEJIEJIA.

3. Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn according to Claim 2, characterized in that: the said specific steps and fertilizer formula parameters are as follows:

(1) Determination of fertilizer ratio in the early stage and completion of the following treatments: Mix 1,000kg of pig manure, 60kg of husks, 1,600L of KEJIEJIA Humic Acid liquid fertilizer, and 20kg of KEJIEJIA Humic Acid powdery fertilizer thoroughly, seal the mixture in a plastic bag for retting at 50-60°C for a week, flip it once, and maintain the sealed condition for another week for retting to occur until the fertilizers are basically odorless;

(2) Orchard Preparation: Remove the weed between the rows of fruit trees in the young orchard where the tree ages range from 1-3 years from late August to mid-September, and start deep plowing to a depth of at least 0.4m in some no less than 0.5m away from the young fruit tree seedlings on either side;

(3) Application of Base Fertilizer: Apply the base fertilizers in parallel with the deep plowing, and the base fertilizers include at least 1,100kg of thoroughly decomposed farmyard manure, at least 45kg of NPK compound fertilizer, and at least 18.5kg of KEJIEJIA Humic Acid powdery fertilizer stated in Step (1). Fully mix the fertilizers with the deeply plowed soil, and rake the soil;

(4) Tuber Treatment: Transform the potatoes into tubers, each containing bud pits, apply KEJIEJIA Humic Acid liquid fertilizer diluted 1:100 times in these tubers and dry them in the air during the cultivation process;

(5) Determination of Row Spacing and Seed Sowing: Arrange the row spacing as 0.4-0.5m, and plant the tubers treated in Step (4) at the center line;

(6) Ridging: Turn the soil in the ditches on both sides of the tuber rows, and use the turned soil to cover the tubers at a thickness of not exceeding 7cm;

(7) Field Management: Apply additional 20kg of NPK compound fertilizer once per mu and spray KEJIEJIA Humic Acid aqueous solution diluted 1:100 times twice, namely, once every 15 days, on the foliage in mid to late October;

(8) Harvesting: Harvest the potatoes from mid-December to early January.

4. Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn according to any of Claims 1-3, characterized in that: the said potato variety selected is the early-maturing variety called Favorita.

5. Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn according to any of Claims 1-3, characterized in that: the said young orchard selected can be peach orchard, plum orchard, citrus orchard, kiwi orchard or pomegranate orchard.

Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn

Field of the Invention

[0001] The present invention relates to the cultivation field, specifically a kind of cultivation method of interplanting potatoes in young orchard during autumn.

Background of the Invention

[0002] Potato, also known as *Solanum tuberosum*, is a plant that can grow up to 15-80cm in height, with either a glabrescent or pubescent appearance. The plant has both an above-ground stem and an underground stem. In China, potato is considered one of the five staple foods due to its high nutritional value, strong adaptability, and large yield. It is also the third most important food crop globally, next to wheat and maize. Potatoes are propagated through tubers and can be used as medicine due to its neutral nature and sweet flavor. They can be used to treat various ailments such as stomach pain, swollen rib, and carbuncles. Evidence has shown that potatoes have a vitamin C content that is approximately four times higher than that of apples. In 2015, the Ministry of Agriculture of PRC proposed a strategy to promote potatoes as a staple food. Therefore, increasing potato production is favorable to food security.

[0003] Fruiting time is deemed as a constraint for orchards. Fruit farmers have virtually no or only minimal income in the first few years, especially the first 1-3 years. During this period, fruit farmers invest in exchange for meager output, which to some extent hinders the development of the orchard. In the prior art, there is also the technology of planting potatoes in orchards. However, due to the improper application of fertilizers (often farmyard fertilizers without being fermented or thoroughly decomposed or directly chemical fertilizers), the yield and quality of potatoes are compromised. This not only disrupts the ecological balance of orchards, but also accelerates weed growth. Weeds compete with seedlings for nutrients, causing slow growth and further delaying the fruiting time and rate of the seedlings, which results in a malicious cycle. Interplanting potatoes in young orchards can provide an early source of income for fruit farmers, indirectly boosting their motivation for fruit tree cultivation.

[0004] With the traditional cultivation techniques, potatoes are typically planted twice a year in southern regions with warm climates, but they are planted under the single cropping model during spring in most areas, with occasional reports of potato cultivation in autumn and winter. Nevertheless, inadequate fertilization, cultivation, and field management during autumn and winter can lead to pathogenic bacteria masses and residues that affect the growth of fruit tree seedlings and cause loss of such seedlings.

Summary of Invention

[0005] To address the impact of improper fertilization and unscientific field management in the existing techniques on the growth of fruit tree seedlings, as well as to further increase the quality and yield of potatoes and boost the economic income from young orchards, the present invention provides a cultivation method characterized in scientific fertilization and field management for young orchards. This method can basically prevent the proliferation of pathogenic bacteria commonly found in traditional cultivation processes, resulting in a yield increase of more than 20%.

[0006] Cultivation Method of Interplanting Potatoes in Young Orchard during Autumn, characterized in that it comprises the following steps:

(1) Determination of fertilizer ratio in the early stage and completion of the following treatments: Mix pig manure, husks, humic acid liquid fertilizer, and humic acid powdery fertilizer thoroughly, seal the mixture in a plastic bag for retting, ensuring to flip it at least once, and maintain the sealed condition for retting to occur;

(2) Orchard Preparation: Remove the weed between the rows of fruit trees in the young orchard from late August to mid-September, and start deep plowing to a depth of at least 0.4m in some no less than 0.5m away from the young fruit tree seedlings on either side;

(3) Application of Base Fertilizer: Apply the base fertilizers in parallel with the deep plowing, and the base fertilizers include thoroughly decomposed farmyard manure and the NPK compound fertilizer stated in Step (1). Fully mix the fertilizers with the deeply plowed soil, and rake the soil;

(4) Tuber Treatment: Transform the potatoes into tubers, each containing bud pits, apply humic acid liquid fertilizer in these tubers and dry them in the air during the cultivation process;

(5) Determination of Row Spacing and Seed Sowing: Arrange the row spacing as 0.4-0.5m, and plant the tubers treated in Step (4) at the center line;

(6) Ridging: Turn the soil in the ditches on both sides of the tuber rows, and use the turned soil to cover the tubers at a thickness of not exceeding 10cm;

(7) Field Management: Apply additional NPK compound fertilizer per mu once and spray humic acid aqueous solution on the foliage in mid to late October;

(8) Harvesting: Harvest the potatoes from mid-December to early January.

[0007] To cultivate potatoes during autumn, it is crucial to address the negative impact of relatively high temperatures on the emergence and growth of seedlings in the early stage of germination, as well as the negative impact of relatively low temperatures on tuberization during the tuberization period. Therefore, most of the traditional cultivation methods use fertilizers to promote potato growth, and such disproportionate fertilization can result in soil compaction and hardening and render the soil components unsuitable for crop growth year by year. The fertilization technique and cultivation method proposed in the present invention are basically harmless to land and potentially increase the income by an additional season. The yield from this method is more than 20% higher compared to conventional products. Moreover, the fertilization technique that focuses on biological fertilizers results in higher quality of harvested potatoes.

[0008] Further, the Applicant concludes through experimental comparison that the said humic acid liquid fertilizer and humic acid powdery fertilizer in Step (1) and the humic acid liquid in Step (7) produced by KEJIEJIA can produce better outcomes.

[0009] Further, the said specific steps and fertilizer formula parameters are as follows:

(1) Determination of fertilizer ratio in the early stage and completion of the following treatments: Mix 1,000kg of pig manure, 60kg of husks, 1,600L of KEJIEJIA Humic Acid liquid fertilizer, and 20kg of KEJIEJIA Humic Acid powdery fertilizer thoroughly, seal the mixture in a plastic bag for retting at 50-60°C for a week, flip it once, and maintain the sealed condition for another week for retting to occur until the fertilizers are basically odorless;

(2) Orchard Preparation: Remove the weed between the rows of fruit trees in the young orchard from late August to mid-September, and start deep plowing to a depth of at least 0.4m in some no less than 0.5m away from the young fruit tree seedlings on either side;

(3) Application of Base Fertilizer: Apply the base fertilizers in parallel with the deep plowing, and the base fertilizers include at least 1,100kg of thoroughly decomposed farmyard manure, at least 45kg of NPK compound fertilizer, and at least 18.5kg of KEJIEJIA Humic Acid powdery fertilizer stated in Step (1). Fully mix the fertilizers with the deeply plowed soil, and rake the soil;

(4) Tuber Treatment: Transform the potatoes into tubers, each containing bud pits, apply KEJIEJIA Humic Acid liquid fertilizer diluted 1:100 in these tubers and dry them in the air during the cultivation process;

(5) Determination of Row Spacing and Seed Sowing: Arrange the row spacing as 0.4-0.5m, and plant the tubers treated in Step (4) at the center line;

(6) Ridging: Turn the soil in the ditches on both sides of the tuber rows, and use the turned soil to cover the tubers at a thickness of not exceeding 7cm;

(7) Field Management: Apply additional 20kg of NPK compound fertilizer once per mu and spray KEJIEJIA Humic Acid aqueous solution diluted 1:100 times twice, namely, once every 15 days, on the foliage in mid to late October;

(8) Harvesting: Harvest the potatoes from mid-December to early January.

[0010] Special Note: The core key technology of the present invention is the combined use and fermentation of pig manure, husks, humic acid liquid fertilizer, and humic acid powdery fertilizer. During the fertilizer application process, while pig manure adds microbial bacteria cenobium and undergoes fermentation, husks are typically either burned into plant ash for use as fertilizer or fed to livestock to produce manure, rather than being directly utilized in fertilizer retting. The Applicant accidentally sprinkled the husks, which were intended to be fed to pigs, onto the thoroughly blended mixture of pig manure, humic acid liquid fertilizer, and humic acid powdery fertilizer. Only the upper layer of the mixture receiving the sprinkled husks was collected, while the lower layer was unusable. Consequently, the Applicant decided to directly add the uncollected husks into the fertilizers. When this fertilizer mixture was applied to potatoes, a noticeable difference was observed from other potato seedlings that were not treated with the addition of husks. The average circumference of the main stem of the seedlings treated with the fertilizer containing husks grew 15% more than those without husks. In contrast with the yellowing of the seedlings treated with fertilizers without husks, the seedlings treated with the addition of husks exhibited strong vitality, particularly in low-temperature conditions. The potato tubers were still able to expand, leading to a harvest extension of at least 10 days. In the same plot, the yield per mu for each season was more than 10% higher than that from the application of fertilizers without the addition of husks.

[0011] Further, the said potato variety selected is the early-maturing variety called Favorita.

[0012] Further, the said young orchard selected can be peach orchard, plum orchard, citrus orchard, kiwi orchard or pomegranate orchard.

[0013] This method used for potato cultivation could achieve balanced reproduction of beneficial bacteria and inhibit the growth of harmful cenobium in the soil. The specially formulated fertilizers can enhance the strong seedling, early tuberization, thick stems, thriving growth and high yields of potatoes while focusing on preventing potato diseases such as early blight and late blight.

The potatoes are basically unaffected by diseases and pests during the entire growth cycle, and the application of foliage fertilizer also develop the fruit tree seedlings' ability to resist diseases, droughts and floods. This said results in higher yields and better quality of potatoes compared to traditional cultivation modes. Furthermore, it can preserve the land and basically eliminate diseases for continuous cropping. In particular, after the orchard moves beyond the young stage, the growth of seedlings in the orchard is more thriving than that with other interplanting methods.

Description of Preferred Embodiment

[0014] In order to more fully illustrate the embodiment of the present invention, the technical effects of the present invention are further illustrated below in combination with specific embodiment. The embodiment described according to the present invention are provided for illustration only, and not for the purpose of limiting the protection scope of the present invention.

[0015] To further verify the effect of the fertilizers and reasonable field management on the interplanting of potatoes in a young orchard, the Applicant has designed and conducted four groups of experiments. The experimental land is situated in Daxiqiao Town, Xixiu District, Anshun City, Guizhou Province. Apart from the data provided separately, all the other conditions remained consistent (same plot divided into different cultivation areas, each group covering an experimental area of 133.3 square meters). The statistical analysis and conclusions are as follows:

(I) 1,000kg of pig manure, 60kg of husks, 1,600L of KEJIEJIA Humic Acid liquid fertilizer, and 20kg of KEJIEJIA Humic Acid powdery fertilizer in Step (1) were mixed proportionately to prepare a fertilizer; in the tuber treatment in Step (4): The tubers were treated with the spraying of KEJIEJIA Humic Acid liquid diluted 1:100 times and dried in the air during the cultivation process; in Step (7), the foliage was treated with the spraying of KEJIEJIA Humic Acid aqueous solution diluted 1:100 times twice, namely, once every 15 days.

[0016] Result: The yield of potatoes per mu reached 1,815kg.

[0017] The yield of potato interplanting in the orchard during the next autumn reached 1,780kg, and no diseases or pests were found.

[0018] (II) 1,000kg of pig manure, 60kg of husks, 1,600L of humic acid liquid fertilizer from a commercially available brand, and 20kg of humic acid powdery fertilizer from a commercially available brand in Step (1) were mixed proportionately to prepare a fertilizer; in the tuber treatment in Step (4): The tubers were treated with the spraying of humic acid liquid diluted 1:100 times from a commercially available brand and dried in the air during the cultivation process; in Step (7), the foliage was treated with the spraying of humic acid aqueous solution diluted 1:100 times from a commercially available brand twice, namely, once every 15 days.

[0019] Result: The yield of potatoes per mu reached 1,650kg.

[0020] (III) 1,000kg of pig manure, 1,600L of KEJIEJIA Humic Acid liquid fertilizer, and 20kg of KEJIEJIA Humic Acid powdery fertilizer in Step (1) were mixed proportionately to prepare a fertilizer; in the tuber treatment in Step (4): The tubers were treated with the spraying of KEJIEJIA Humic Acid liquid diluted 1:100 times and dried in the air during the cultivation process; in Step (7), the foliage was treated with the spraying of KEJIEJIA Humic Acid aqueous solution diluted 1:100 times twice, namely, once every 15 days.

[0021] Result: The yield of potatoes per mu reached 1,550kg.

[0022] The experimental data of the second and third groups supported the possibility of potato interplanting during the next autumn. There was a slight decrease in yield, and minor early and late blight occurred in the second year, resulting in a yield decrease by less than 7%.

[0023] (IV) Under traditional cultivation modes, pig manure is simply stacked, and potato tubers are mixed with plant ash, supplemented by additional fertilization once in the halfway.

[0024] Result: The yield of potatoes per mu reached 1,321kg. Late blight occurred during the process. More rotted tubers were found. Potato interplanting in the next autumn witnessed a yield decrease to 1,220kg per mu and the occurrence of more serious diseases.

[0025] The foregoing descriptions are the embodiment of the present invention only, and not for the purpose of limiting the invention. All equivalents, equivalent changes and improvements made by using the contents stated in the application documents of the present invention fall within the scope of patent protection of the present invention.