Full-Scenario Common Problem Troubleshooting Guide for Agricultural Silicone Surfactant

As a new foreign trade service provider driven by technological transformation and foreign trade services, HiSiaddi has established a "1+2+3+4=1" service system and can supply original factory materials of multiple well-known brands for Agricultural silicone surfactant. Having deeply engaged in the foreign trade market of Agricultural silicone surfactant for over a decade, HiSiaddi sorts out key points requiring attention during the entire purchasing decision-making process of Agricultural silicone surfactant from a professional perspective and shares them with you.

If you have various questions regarding Agricultural silicone surfactant, please contact HiSiaddi customer service or visit our official website www.hisiaddi.com for more professional and in-depth analysis.

I. Basic Product Overview

Polyether-modified heptamethyltrisiloxane (agricultural silicone surfactant, modified product of heptamethyltrisiloxane polyether) belongs to super spreadable silicone auxiliary agent, appearing as colorless to pale yellow transparent homogeneous liquid. It integrates ultra-low surface tension, rapid spreading & wetting, penetration and systemic absorption enhancement performance, serving as a special auxiliary agent for pesticides, foliar fertilizers and plant growth regulators.

Physicochemical Properties: Miscible with water, alcohols and conventional pesticide emulsions/aqueous suspensions at normal temperature; surface tension as low as 20–22 mN/m; applicable pH range 5.0–8.0; strong acid, strong alkali and long-term high temperature will destroy polyether siloxane structure; high-concentration inorganic salts cause system stratification; iron and copper metal ions accelerate raw material yellowing and degradation.
Main Application Scenarios: Foliar spraying of insecticides, fungicides and herbicides, water-soluble foliar fertilizers, plant growth regulators, orchard pest UAV aerial spraying, conventional field spraying, seedling nursery spraying and soil penetration root irrigation. Conventional Addition Dosage: 0.02%–0.1% for conventional spraying, 0.05%–0.15% for UAV aerial spraying.
Core Degradation and Fault Inducers: High-temperature oxidative yellowing during storage, destruction of siloxane skeleton by extreme pH in water, stratification and flocculation when mixed with high-salt hard water, flocculation and precipitation when mixed with high-concentration anionic auxiliaries, crop phytotoxicity caused by excessive addition, turbid precipitation during low-temperature storage, polyether degradation via long-term open storage and massive foam generated by high-speed stirring and air entrainment during processing. High-Frequency Faults: Yellowed and darkened raw materials, whitened stratified liquid after mixing with pesticides, failed spreading and penetration during spraying, crop leaf burn phytotoxicity, excessive foam in spray tanks, turbid flocculent precipitates at low temperature, sharply reduced efficacy and fertilizer efficiency, and water droplets rolling off leaf surfaces without adhesion.

II. Core Quality Control Standards and General Pre-Troubleshooting Process

2.1 Judgment Benchmark for Core Quality Control Indicators of Polyether-Modified Heptamethyltrisiloxane Agricultural Silicone

Test Indicator	Qualified Product Standard	Applicable Scenarios	Intuitive Abnormal Performance
Appearance & Chroma	Colorless to pale yellow transparent liquid without flocs, precipitates or stratification	All agricultural spraying scenarios	Dark yellow/brown color, turbid liquid, white flocculent precipitates at low temperature

Test Indicator	Qualified Product Standard	Applicable Scenarios	Intuitive Abnormal Performance
Surface Tension	20–22mN/m (0.1% aqueous solution)	All pesticide synergistic systems	Elevated surface tension, poor leaf spreading and rolling water droplets leading to reduced control efficacy
Effective Siloxane Content	≥98%	UAV aerial spraying, high-hardness water and high-end pesticide formulations	Insufficient wetting and penetration with no synergistic effect at equal dosage
Turbidity (0.1% Aqueous Solution)	Clear and transparent without milky turbidity	Aqueous agent and suspension agent mixing systems	Whitened emulsion after water dilution, stratification upon standing and blocked spray nozzle filters
Stock Solution pH	6.0–7.5	Storage and field mixing & application	Rapid degradation and stratification after water dilution when pH is too low or too high
Moisture	≤0.2%	Emulsion and oil suspension compounding systems	Severe foaming after compounding and long-term storage stratification

2.2 General Four-Step Pre-Troubleshooting Process

1. Batch Comparison: Synchronous water dilution wetting test, pesticide compatibility test and high-low temperature accelerated storage test for new raw materials and qualified retained samples to distinguish raw material degradation from field water quality and pesticide compatibility issues;
2. Core Screening: Prioritize testing five key fault indicators including surface tension, stock solution chroma, pH, water hardness and ionic type of mixed pesticides;

3. Working Condition Tracing: Record field water pH, hardness, salinity, anionic/cationic type of pesticides, spraying concentration, ambient temperature and seedling/adult plant stage of crops;
4. Root Cause Judgment: Core shortcomings of agricultural silicone — rapid chain scission and failure under extreme acid/alkali, easy stratification and flocculation with high-salt hard water, leaf cuticle over-damage and phytotoxicity from excessive addition, precipitation and loss of wetting performance at low temperature, polyether oxidative yellowing under long-term open storage.

III. Full-Scenario Fault Troubleshooting, Root Causes and Disposal Solutions

3.1 Basic Raw Material Storage Faults

3.1.1 Raw Material Yellowing & Browning and Deteriorated Wetting & Penetration Performance

Fault Phenomenon: Pale yellow liquid of original package gradually darkens to yellowish brown during long-term storage, surface tension rises at equal water dilution concentration and leaf spreading effect is significantly weakened.

Core Root Causes: Warehouse temperature＞35℃ damaging polyether side chains; iron ions precipitated from carbon steel storage tanks catalyzing oxidative degradation of siloxanes; long-term air exposure via open packaging; stock solution pH deviating from neutral range accelerating degradation.

Disposal Solutions: Store raw materials in light-proof sealed PE/304 stainless steel tanks at 10–30℃; slightly pale yellow materials can be used for field adult plant herbicides and high-tolerance crop spraying; directly scrap dark brown discolored materials with excessive surface tension and prohibit their use on fruits, seedlings and UAV high-concentration formulations.

3.1.2 Turbidity and White Flocculent Precipitation During Low-Temperature Storage

Fault Phenomenon: Raw materials turn turbid at ambient temperature＜5℃ in winter with flocculent precipitates at tank bottom; slowly recover transparency after standing at normal temperature but remain whitened and stratified when directly diluted with water at low temperature.

Core Root Causes: Reduced solubility of polyether modified side chains at low temperature triggering siloxane chain precipitation; high content of low-molecular impurities in raw materials aggravating low-temperature precipitation.

Disposal Solutions: Store raw materials at constant temperature ≥10℃; preheat and stir raw materials to complete transparency at 25–30℃ before mixing & application; downgrade or scrap materials with severe precipitation that retain turbidity after heating.

3.1.3 Excessive Surface Tension After Storage and Lost Synergistic Efficacy

Fault Phenomenon: Surface tension of fresh raw materials is within 22mN/m at equal water dilution, while stored samples exceed 26mN/m; water droplets cannot spread on leaf surfaces and pesticide utilization rate drops sharply.

Core Root Causes: Dual oxidation damage of polyether hydrophilic side chains by high temperature and metal ions; continuous degradation of modified side chains via air exposure due to poor sealing; excessive acid/alkali stock solution accelerating molecular hydrolysis.

Disposal Solutions: Implement first-in first-out with inventory cycle controlled within 6 months; seal storage tanks to isolate air; re-test surface tension quarterly and directly scrap batches with substandard indicators.

3.2 Conventional Field Pesticide Spraying System Faults

3.2.1 Rolling Water Droplets on Leaf Surfaces, Poor Spreading and Low Pesticide Adhesion & Insufficient Efficacy

Fault Phenomenon: Large water droplets form on leaf surfaces and slide off rapidly after spraying without uniform water film coverage, leading to sharply reduced pest and disease control efficacy.

Core Root Causes: Insufficient addition dosage of silicone; degraded raw materials with elevated surface tension; high water hardness and salinity in field water destroying wetting system; antagonism between high-concentration anionic auxiliaries in pesticides and silicone.

Disposal Solutions: Raise addition ratio within standard range; replace fresh undegraded raw materials; dilute silicone with clean water first before adding pesticides; match water quality buffer agents to reduce hardness for high-hardness water sources.

3.2.2 Leaf Burn, Yellow Spots and Wilting Phytotoxicity on Crops

Fault Phenomenon: Brown burn spots appear on thin tender leaves and seedlings 1–3 days after spraying, new leaves curl and wilt, and flower spots emerge on fruits of fruit and vegetable crops.

Core Root Causes: Excessive silicone addition excessively destroying leaf cuticle; spraying at noon under high temperature triggering rapid water concentration and intensified penetration stimulation; applying adult plant dosage on seedling and young fruit crops with low tolerance; high inherent pesticide toxicity superimposed with silicone synergism.

Disposal Solutions: Lower addition lower limit for seedlings and fruit & vegetable crops; avoid spraying at noon above 30℃ high temperature; strictly control maximum addition concentration; light spray clean water to buffer after high-temperature spraying.

3.2.3 Excessive Foam in Spray Tanks, Overflowing Liquid and Blocked Spray Nozzles

Fault Phenomenon: Massive persistent fine foam generates inside tanks after mixing pesticides, liquid overflows during filling and air bubbles block nozzles during spraying leading to uneven atomization.

Core Root Causes: Residual unreacted polyether impurities in silicone raw materials; massive air entrainment via high-speed stirring and high-pressure recirculation backflow; synergistic foaming when mixed with emulsions and anionic auxiliaries; one-time direct pouring of high-concentration stock solution.

Disposal Solutions: Select low-foam refined agricultural silicone; mix at low stirring speed to reduce impact of recirculation backflow; match special silicone defoamers; dilute and add raw materials in batches slowly to avoid direct addition of concentrated stock solution at one time.

3.3 UAV Aerial Spraying High-Concentration Spray System Faults

3.3.1 Stratification and Milky Turbidity of UAV Concentrated Liquid Blocking Fine Nozzles

Fault Phenomenon: UAV concentrated mother liquor stratifies up and down upon standing, rapidly blocking spray nozzle filters with uneven atomization particle size and local excessive dosage triggering phytotoxicity.

Core Root Causes: Excessively high salinity and auxiliary concentration of UAV concentrated liquid triggering flocculation between silicone and anionic pesticides; mixing raw materials without preheating at low temperature; direct preparation of concentrated mother liquor with hard water.

Disposal Solutions: Prepare UAV mother liquor with soft water; preheat raw materials to normal temperature before dilution; dilute silicone first then gradually mix with pesticides; match water quality buffer agents to reduce ionic antagonism.

3.3.2 Fast Sedimentation of UAV Spray Liquid, Drifting Droplets and Uneven Local Dosage

Fault Phenomenon: Severe drift of droplets during high-altitude spraying with excessive local concentration triggering burns nearby and insufficient dosage leading to poor control efficacy far away.

Core Root Causes: Excessive silicone addition lowering liquid viscosity and generating ultra-fine drifting droplets; unbalanced sedimentation rate due to excessive wetting strength of concentrated system; lack of anti-drift components in compounded auxiliaries.
Disposal Solutions: Lower upper limit of UAV addition dosage; compound with anti-drift auxiliaries; balance spreading and drift risks by controlling flight height and spraying speed.

3.4 Foliar Fertilizer & Water-Soluble Fertilizer Spraying System Faults

3.4.1 White Flocculent Precipitates and Tank Bottom Caking After Mixing with Water-Soluble Fertilizers

Fault Phenomenon: White flocs form after mixing high-nitrogen-phosphorus-potassium high-salt foliar fertilizers with silicone, blocking filters and inactivating both fertilizers and auxiliaries.
Core Root Causes: High-concentration calcium-magnesium ions and inorganic salts destroying silicone polyether hydrophilic structure; extreme fertilizer pH triggering siloxane hydrolysis; antagonistic flocculation between anionic chelating agents in fertilizers and silicone.
Disposal Solutions: Dilute separately — dilute fertilizers and silicone individually first, adjust mixed liquid pH to neutral before blending; reduce fertilizer concentration and prepare for immediate use; select salt-resistant modified silicone grades for agricultural use.

3.4.2 Poor Absorption of Foliar Fertilizers, Slow Fertilizer Efficiency and Low Leaf Liquid Retention

Fault Phenomenon: Foliar fertilizers slide off rapidly after spraying with insufficient nutrient penetration and absorption, showing no obvious improvement in crop growth.
Core Root Causes: Insufficient silicone addition dosage; degraded raw materials with lost wetting performance; high fertilizer salt inhibiting spreading; unbalanced acid-base mixing water destroying auxiliary structure.
Disposal Solutions: Raise compliant addition dosage; replace fresh raw materials; match buffer agents to neutralize water pH and reduce ionic antagonism from salt.

3.5 Seedling & Fruit Tree Root Irrigation and Soil Penetration System Faults

3.5.1 Shallow Penetration of Soil Liquid with Water & Fertilizer Remaining Only on Surface Layer Unable to Infiltrate Deep Roots

Fault Phenomenon: Water and fertilizer only stay on topsoil after root irrigation without liquid penetration to deep root layers, leading to poor control efficacy against root rot and underground pests.

Core Root Causes: Insufficient silicone addition unable to lower surface tension of soil aggregates; excessive soil salinity and alkalinity degrading auxiliaries; impaired penetration capacity caused by hard mixing water.
Disposal Solutions: Moderately increase silicone dosage; neutralize liquid pH with buffer agents before soil irrigation; prepare root irrigation liquid with soft water to improve soil wetting and penetration performance.
3.5.2 Brown Spots on Fruit Peels and Rough, Damaged Fruit Surface
Fault Phenomenon: Small brown spots appear on fruit peels after spraying during fruit expansion period, losing smooth fruit surface and reducing commodity value.
Core Root Causes: Excessive silicone addition during young fruit stage damaging peel cuticle; high-temperature strong light spraying triggering liquid concentration and peel burns; irritation to fruit peels when emulsifiable pesticides are compounded with silicone.
Disposal Solutions: Lower silicone addition ratio during young fruit stage; spray in morning and evening low-temperature periods; reduce simultaneous compounding of emulsifiable preparations and prioritize matching with water-dispersible granules and aqueous agents.

IV. Special Troubleshooting of Compatibility Conflicts and Adaptable Systems

4.1 Incompatible Systems Prone to Failure and Compatibility Taboos

1. Strong acid liquid pH＜4, strong alkali liquid pH＞9: Rapid hydrolysis and chain scission of siloxane polyether segments with complete loss of wetting and synergistic performance;
2. High-concentration calcium-magnesium inorganic salts and high-salt water-soluble fertilizers: Ions destroy hydrophilic layers triggering stratification, flocculation and precipitate blocking of nozzles;
3. High-addition anionic surfactants: Charge antagonism leading to silicone precipitation and failure with severe foaming;
4. Iron and rust mixing/storage tanks: Iron ions catalyze silicone oxidative yellowing and shorten storage validity period;
5. Long-term high-temperature storage＞35℃ and liquid mixing at temperature above 40℃: Accelerated polyether degradation and continuous rise of surface tension;
6. Long-term storage at low temperature＜5℃: Precipitation of flocs from raw materials leading to whitened stratified liquid after water dilution and lost spreading capacity.

4.2 Optimal Synergistic Compound Systems

Polyether-modified heptamethyltrisiloxane + nonionic pesticide auxiliaries: No flocculation antagonism, stably improved spreading and penetration, suitable for all types of aqueous agents and suspension agents;
Polyether-modified heptamethyltrisiloxane + water quality buffer agents: Neutralize water acid-base and reduce hard water ion impacts for stable compounding with high-salt fertilizers;
Polyether-modified heptamethyltrisiloxane + low-foam silicone defoamers: Eliminate mixing foam without weakening wetting and synergistic effects;
Polyether-modified heptamethyltrisiloxane + anti-drift auxiliaries: Suitable for UAV aerial spraying balancing droplet sedimentation and leaf adhesion;
Polyether-modified heptamethyltrisiloxane + neutral water-soluble fertilizers: Improve leaf and soil penetration efficiency of water and fertilizer without stratification or precipitation risks.

4.3 Standard Feeding, Mixing & Storage Process Specifications

1. Storage Specifications: Seal and store in PE plastic or 304 stainless steel tanks at constant temperature 10–30℃ away from light; carbon steel containers are prohibited; inventory cycle ≤6 months with first-in first-out principle; preheat raw materials above 20℃ before use in low-temperature environments;
2. Dilution Specifications: Prohibit direct pouring of stock solution into concentrated pesticides/fertilizers; dilute silicone with clean water first and stir evenly before adding pesticides and foliar fertilizers; pre-add water quality buffer agents for high-hardness water sources;
3. Mixing Water Temperature Specifications: Control mixing water temperature at 10–30℃; prohibit direct dilution with hot water above 40℃; suspend mixing and spraying at noon under high temperature;
4. Ratio Specifications: Adopt lower addition limit for seedlings, young fruits and thin-leaf crops; medium-upper standard limit for mature field crops and woody fruit trees; strictly control maximum addition threshold for UAV concentrated liquid;
5. Equipment Specifications: Select plastic/stainless steel mixing tanks and delivery pipelines, prohibit long-term storage of silicone in iron rust containers; install 60-mesh pre-filter on mixing pipelines to intercept precipitated impurities;
6. pH Control: Stabilize mixed liquid pH at 5.0–8.0; dilute strong acid and alkali pesticides separately before mixing to avoid direct mixing-induced silicone hydrolysis.

V. Raw Material Degradation Failure Judgment and Standardized Rectification

5.1 Degradation Failure Judgment Standards

1. Raw Material Degradation: Dark yellow and turbid liquid, massive flocculent precipitation at low temperature, surface tension＞25mN/m, stock solution pH deviating from 6.0–7.5 range and whitened stratification after water dilution;
2. Process/Mixing Degradation: Mixing without preheating low-temperature raw materials, direct mixing of strong acid/alkali stock solutions, long-term storage in iron containers, dilution with high-temperature hot water and excessive addition dosage;
3. Field Finished Product Failure Characteristics: Rolling water droplets on leaves without spreading, stratified liquid blocking nozzles, crop leaf & peel burn, excessive overflowing foam and insufficient pesticide/fertilizer penetration leading to reduced efficacy;
4. Safety Failure: Increased degraded impurities in auxiliaries stimulating crop tissue with large-area phytotoxicity risks, failing to meet agricultural auxiliary application specifications.

5.2 Standardized Rectification Measures

1. Raw Material Control: Mandatory incoming inspection of appearance, surface tension, stock solution pH, low-temperature compatibility and transparency of 0.1% aqueous solution; downgrade or directly reject unqualified raw materials after preheating and filtration; light-proof low-temperature storage in PE/stainless steel tanks with controlled inventory cycle;
2. Mixing Process Control: Enforce pre-dilution of silicone with clean water and preheating of low-temperature raw materials; dilute pesticides and fertilizers step by step to avoid direct mixing of extreme acid-base substances; control mixing water temperature within normal range and stir at low speed to reduce foaming; install filtration devices on pipelines;
3. Formula Dosage Control: Differentiate addition dosage based on crop growth stage and spraying mode with lower dosage for thin-tender crops; match buffer agents for high-salt and extreme acid-alkali pesticides; compound with defoamers to suppress foam;
4. Quality Control: Retain samples of each batch for 5℃ low-temperature and 40℃ high-temperature 7-day accelerated testing with re-inspection of surface tension and water dilution compatibility; conduct small-area

pre-spray test for each new pesticide and fertilizer combination to confirm no phytotoxicity before large-scale operation.

VI. On-Site Fault Troubleshooting of Storage and Mixing Equipment

6.1 Batch Raw Material Yellowing and Performance Degradation from Long-Term Storage in Iron Tanks

Fault Root Causes: Rust precipitation from carbon steel continuously catalyzing oxidative degradation of silicone polyethers, deepening color and raising surface tension of the entire tank of raw materials.

Disposal Solutions: Fully replace PE plastic and 304 stainless steel storage tanks and mixing barrels; apply anti-corrosion coating on inner wall of old iron containers and prohibit long-term silicone storage; seal tanks away from light and isolate air.

6.2 Whitened Stratified Liquid and Blocked Nozzles From Mixing Without Preheating Low-Temperature Raw Materials

Fault Root Causes: Precipitation of silicone flocs from low-temperature raw materials and direct water dilution without heating and dissolving leading to suspended flocs turning liquid milky and rapidly blocking filter screens.

Disposal Solutions: Maintain constant warehouse temperature ≥10℃; preheat raw materials to 25℃ with warm water and stir to full transparency before dilution; prepare mixing liquid with normal-temperature soft water in winter.

6.3 Flocculation Precipitation and Failure From Direct Mixing of Concentrated Pesticides/Fertilizers

Fault Root Causes: Direct contact of undiluted silicone with high-concentration anionic auxiliaries and high-salt fertilizers triggering ionic antagonism to generate insoluble flocculent precipitates with complete loss of wetting and synergistic performance.

Disposal Solutions: Uniformly implement the mixing sequence of "dilute silicone with clean water first, then add pesticides and fertilizers"; match water quality buffer agents for high-salt systems to reduce ionic antagonism reactions.

6.4 Large-Area Crop Burn Phytotoxicity From High-Temperature Mixing and Noon Spraying

Fault Root Causes: Excessive penetration of silicone through leaf cuticle at high temperature, rapid water concentration of liquid leading to sharp local pesticide concentration and burn of thin-walled tissue and fruit peels.

Disposal Solutions: Avoid spraying at noon above 30℃ high temperature; control mixing water temperature not exceeding 30℃; lower silicone addition ratio for seedlings and young fruit crops.

VII. Three-Level Emergency Disposal Process for Faults

7.1 Level 1 Minor Fault (Adjust Online and Continue Normal Operation)

Fault Performance: Slightly pale yellow raw materials with a small amount of precipitation at low temperature recovering full transparency after heating, surface tension 22–24mN/m; slight foam during field mixing without stratification or phytotoxicity.

Disposal: Preheat and filter raw materials before use; slightly lower addition ratio; increase defoamer dosage during mixing, only applicable to field adult plant herbicides and high-tolerance crops.

7.2 Level 2 Moderate Fault (Reduce Load and Restrict Usage)

Fault Performance: Moderately yellowish brown raw materials with surface tension 24–26mN/m; slight milky turbidity after water dilution, a small amount of foam and slight leaf yellowing without burn spots.

Disposal: Downgrade for mature woody fruit trees and soil root irrigation; prohibit use on seedlings, young fruits and UAV high-concentration systems.

7.3 Level 3 Severe Fault (Stop Use and Scrap, Forbid Spraying)

Fault Performance: Dark brown turbid raw materials with massive flocculent precipitates remaining after heating, surface tension＞26mN/m; batch stratified liquid after mixing blocking nozzles and large-area leaf burn and fruit surface spots after spraying.

Disposal: Immediately isolate and stop using failed silicone raw materials, thoroughly clean mixing barrels, pipelines and nozzles; replace with brand-new qualified raw materials; spray clean water on sprayed plots to alleviate phytotoxicity.

VIII. Long-Term Preventive Management Specifications

1. Incoming Quality Inspection: Mandatory inspection of appearance chroma, surface tension, stock solution pH, transparency of 0.1% aqueous solution and low-temperature static compatibility for each batch; allow warehousing only after all indicators pass;
2. Storage Red Lines: Store in light-proof sealed PE/stainless steel tanks at constant temperature 10–30℃ with inventory cycle ≤6 months; prohibit iron containers, high temperature, low temperature and open storage;
3. Mixing Process Red Lines: Prohibit direct mixing of stock solution with concentrated pesticides/fertilizers, feeding without preheating low-temperature raw materials, dilution with hot water above 40℃, long-term storage in iron barrels and addition above upper concentration limit;

4. Field Formula Red Lines: Differentiate addition dosage based on seedling/adult plant, fruit & vegetable/field crop and UAV/conventional spraying; match water quality buffer agents for high-salt and extreme acid-alkali liquid; stop spraying during high-temperature periods;
5. Retained Sample Monitoring: Conduct 5℃ low-temperature and 40℃ high-temperature 7-day accelerated testing on batch retained samples with re-inspection of surface tension and water dilution compatibility; conduct small-area pre-spray test for each new pesticide and fertilizer combination.

IX. On-Site Quick Self-Inspection Reference Table

Intuitive On-Site Phenomenon	Priority Test Indicators	Core Root Cause	Quick Mitigation Measures
Yellowed silicone raw materials and deteriorated leaf spreading effect	Storage tank material, storage temperature, storage cycle, surface tension	Iron ion catalytic oxidation, high-temperature degradation and broken polyether chains	Replace stainless steel/PE storage tanks, store at low temperature away from light, reduce dosage for slightly yellowed materials and scrap severely degraded batches
Turbid precipitates of low-temperature raw materials, whitened stratified liquid blocking nozzles after water dilution	Storage temperature, low-temperature compatibility of raw materials, preheating procedure	Siloxane precipitation at low temperature and direct dilution without heating	Preheat and stir to full transparency at 25–30℃, prepare mixing liquid with soft water and install filters
Rolling water droplets on leaves after spraying with insufficient pest & fertilizer control efficacy	Silicone addition dosage, raw material surface tension, water hardness & pH	Insufficient dosage, degraded auxiliaries, hard water and acid-base antagonism	Raise compliant addition ratio, replace fresh raw materials and match water quality buffer agents
Brown burn spots and wilting on	Addition concentration, spraying	Excessive addition dosage, concentrated	Lower addition lower limit, spray at low temperature morning

Intuitive On-Site Phenomenon	Priority Test Indicators	Core Root Cause	Quick Mitigation Measures
leaves & young fruits	temperature, crop growth stage	penetration at noon high temperature, low tolerance of seedlings	and evening, spray clean water to buffer burned plots
Massive overflowing foam in mixing tanks and blocked atomization nozzles	Raw material impurities, stirring speed, one-time direct pouring of concentrated liquid	Residual polyether impurities, air entrainment via high-speed stirring and concentrated one-time feeding	Match special silicone defoamers, dilute and feed in batches at low stirring speed
White flocculent precipitates after mixing water-soluble fertilizers and pesticides	Water salinity, pH, mixing dilution sequence	High calcium-magnesium ions, extreme acid-base, antagonism without pre-dilution	Dilute silicone with clean water first, match buffer agents and mix separately after dilution
Stratified UAV concentrated liquid and uneven atomization with severe droplet drift	Raw material preheating status, mother liquor salt concentration, addition ratio	Low-temperature precipitation, high-salt flocculation, excessive silicone leading to ultra-fine drifting droplets	Preheat raw materials, lower salt concentration of concentrated liquid and reduce upper addition limit for UAV spraying
Water & fertilizer only staying on surface soil with poor deep penetration during root irrigation	Silicone dosage, mixed liquid pH, soil salinity & alkalinity	Insufficient addition dosage, auxiliary degradation via acid-base imbalance, soil ionic antagonism	Raise silicone addition dosage and neutralize mixed liquid to neutral range

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