



Weed Management in Jasmine: A Sustainable Approach for Enhancing Flower Yield, Quality and Farm Profitability

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The Fragrant Treasure of Indian Floriculture

Jasmine has been an integral part of Indian culture, tradition, and economy for centuries. Admired for its enchanting fragrance and elegant white blossoms, jasmine is often referred to as the "Queen of Fragrant Flowers." The crop occupies a unique position among commercial flower crops because of its multifaceted uses in religious rituals, weddings, cultural celebrations, perfumery, cosmetics, aromatherapy, pharmaceutical preparations, and the extraction of high-value essential oils. Fresh jasmine flowers are indispensable in South Indian households, where they are woven into garlands, hair adornments, and floral decorations, creating a continuous market demand throughout the year.

India is one of the world's leading producers of jasmine, cultivating the crop across diverse agro-climatic regions. Tamil Nadu alone accounts for a major share of the country's production, followed by Karnataka, Andhra Pradesh, Telangana, Kerala, and parts of Maharashtra. Districts such as Madurai, Dindigul, Tirunelveli, Salem, Tiruchirappalli, Cuddalore, Erode, and Virudhunagar have earned national recognition for commercial jasmine cultivation. Popular species including *Jasminum sambac* (Arabian jasmine), *Jasminum grandiflorum* (Spanish jasmine), and *Jasminum auriculatum* (Juhi) are widely cultivated because of their superior fragrance, attractive flowers, and excellent market value. Thousands of small and marginal farmers depend on jasmine cultivation as a dependable source of income, while flower traders, garland makers, perfume manufacturers, and exporters derive substantial employment opportunities from this flourishing industry.

Unlike many annual crops, jasmine is a perennial shrub capable of remaining productive for more than fifteen years under scientific management. Once established, the plantation provides regular income through continuous flowering over several years. However, achieving consistent flower production requires meticulous management practices, including irrigation, nutrient management, pruning, pest and disease control, and above all, effective weed management. Every management practice contributes directly to flower yield and quality, but among them, weed management is often overlooked despite its profound influence on crop performance.

Why Are Weeds a Serious Concern in Jasmine?

A healthy jasmine plantation represents a significant investment. Farmers invest considerable resources in quality planting material, land preparation, fertilizers, irrigation systems, pruning operations, labour, and plant protection measures. Nevertheless, if weeds are allowed to flourish unchecked, much of this investment is wasted because weeds aggressively compete with jasmine plants for the same natural resources essential for growth.

Weeds are unwanted plants that grow naturally in cultivated fields. Although they play useful ecological roles in natural ecosystems, their presence in agricultural fields becomes detrimental because they compete directly with crops for water, nutrients, sunlight,

and space. In perennial crops like jasmine, weeds emerge repeatedly throughout the year due to regular irrigation and favourable climatic conditions. Since jasmine bushes are planted at relatively wider spacing, sufficient sunlight reaches the soil surface during the initial years of establishment, creating an ideal environment for weed germination and rapid growth.

Many weed species possess extraordinary survival mechanisms. Some reproduce through enormous quantities of seeds, while others spread through underground rhizomes, stolons, bulbs, or tubers. Certain weeds complete their life cycle within a few weeks, whereas perennial weeds survive for many years despite repeated removal. Consequently, weed management in jasmine is not a one-time operation but a continuous and carefully planned activity throughout the productive life of the plantation.

Hidden Losses Caused by Weeds

The damage caused by weeds is often underestimated because their effects develop gradually. Initially, weeds appear harmless, but as they multiply, they begin to dominate the plantation. Their vigorous root systems absorb large quantities of soil moisture, depriving jasmine plants of water, particularly during dry periods. Moisture stress weakens plant growth, delays flower bud initiation, reduces flower size, and shortens the productive lifespan of the bushes.

Nutrient competition is equally severe. Modern jasmine cultivation depends heavily on balanced fertilizer application to sustain continuous flowering. However, rapidly growing weeds frequently absorb applied nitrogen, phosphorus, potassium, and micronutrients before jasmine plants can utilize them efficiently. Consequently, fertilizer-use efficiency declines while production costs increase. Farmers often attribute poor flowering to inadequate fertilizer application, whereas the real culprit is unchecked weed competition.

The competition extends beyond water and nutrients. Tall and vigorous weeds intercept sunlight, reducing photosynthesis in jasmine plants and restricting vegetative development. Dense weed growth also restricts air circulation around the bushes, creating a humid microenvironment favourable for fungal diseases such as leaf spot, wilt, and root rot. Furthermore, many weeds serve as alternate hosts for insect pests including aphids, thrips, mites, whiteflies, and nematodes, thereby increasing pest pressure within the plantation.

Harvesting jasmine flowers is a delicate and labour-intensive operation carried out almost every day during the flowering season. Dense weed growth obstructs movement between rows, increases harvesting time, and often conceals flowers beneath the foliage, resulting in harvest losses. Flowers collected from heavily infested fields are frequently contaminated with weed fragments, dust, and soil particles, lowering their market value. Thus, weeds reduce both the quantity and quality of marketable flowers.

Studies conducted in perennial horticultural crops indicate that uncontrolled weeds can reduce flower yield by 30–50 percent, and under severe infestations the losses may be even greater. Such reductions directly affect farm profitability because flower production depends on continuous harvesting and premium-quality blossoms.

Integrated Weed Management: The Need of the Hour

Traditionally, farmers relied primarily on manual weeding to maintain clean fields. Although hand weeding remains effective, increasing labour shortages and rising wages have made this practice expensive and difficult to sustain. On the other hand, continuous dependence on herbicides alone is neither economical nor environmentally desirable because repeated use of the same chemicals may lead to herbicide resistance, soil degradation, and reduced biodiversity.

This has led to the adoption of **Integrated Weed Management (IWM)**—a holistic approach that combines preventive measures, cultural practices, mulching, mechanical methods, biological techniques, and judicious herbicide use. Rather than attempting to eradicate every weed, IWM focuses on maintaining weed populations below economically damaging levels while preserving soil health and environmental quality.

Integrated Weed Management begins with prevention and continues through timely field monitoring, appropriate cultural practices, efficient irrigation, balanced nutrient

management, regular pruning, strategic mulching, selective herbicide application, and periodic mechanical weeding. Each component complements the others, creating a sustainable production system that minimizes weed competition while enhancing flower yield and farm profitability.

As climate change, labour scarcity, and environmental concerns continue to challenge modern agriculture, Integrated Weed Management has emerged as one of the most important technologies for sustainable jasmine cultivation. Farmers who successfully integrate multiple weed management practices not only obtain higher yields and superior flower quality but also improve soil fertility, conserve water, reduce production costs, and ensure the long-term productivity of their plantations.

In the following sections, we will explore the major weed species found in jasmine fields, understand how they affect crop growth, and discuss practical, economical, and environmentally friendly weed management strategies that every jasmine grower can adopt for profitable and sustainable flower production.

Understanding Weed Flora in Jasmine Plantations

A clear understanding of the weed species present in jasmine fields is the first step towards developing an effective weed management programme. Weed flora differs from one region to another depending on soil type, climate, irrigation practices, cropping history, and seasonal rainfall. In tropical regions, where jasmine is cultivated under irrigated conditions, a wide range of annual and perennial weeds emerge throughout the year, making weed management a continuous challenge rather than a seasonal operation.

Generally, weeds occurring in jasmine plantations are grouped into three categories: grasses, sedges, and broad-leaved weeds. Grassy weeds are highly competitive because of their rapid growth and fibrous root systems. Species such as *Cynodon dactylon* (Bermuda grass), *Digitaria sanguinalis*, *Dactyloctenium aegyptium*, and *Echinochloa colonum* spread quickly during the rainy season and utilize large quantities of soil moisture and nutrients. Once established, these weeds form dense mats that suppress crop growth and interfere with intercultural operations.

Among sedges, *Cyperus rotundus* (purple nut sedge) is considered one of the most troublesome weeds in jasmine plantations. It propagates through underground tubers that remain dormant in the soil for long periods and regenerate rapidly after rainfall or irrigation. Even repeated hand weeding often fails to eliminate this weed completely because new shoots continuously emerge from underground propagules. Unless an integrated approach is adopted, *Cyperus rotundus* can dominate the plantation and significantly reduce flower production.

Broad-leaved weeds are equally problematic. Species such as *Amaranthus viridis*, *Parthenium hysterophorus*, *Trianthema portulacastrum*, *Portulaca oleracea*, *Commelina benghalensis*, *Cleome viscosa*, and *Phyllanthus niruri* are commonly observed in commercial jasmine fields. These weeds grow vigorously during the monsoon season, produce thousands of seeds, and establish dense populations within a short period. Because many of these seeds remain viable in the soil for several years, delayed weed control results in a persistent weed seed bank that becomes increasingly difficult to manage.

The composition and intensity of weed flora also change with the seasons. During the southwest and northeast monsoons, favourable moisture and warm temperatures promote rapid germination of annual weeds. In summer, drought-tolerant perennial weeds such as *Cynodon dactylon* and *Cyperus rotundus* continue to survive by utilizing underground rhizomes and tubers. Irrigated jasmine plantations provide an ideal environment for weed growth throughout the year, emphasizing the importance of continuous monitoring and timely management.

The Critical Period of Crop–Weed Competition

Not all stages of crop growth are equally sensitive to weed competition. Research has shown that there is a **critical period of crop–weed competition**, during which weeds must be

controlled to prevent significant yield loss. In newly established jasmine plantations, the first three to four months after planting are particularly critical because young plants possess shallow root systems and limited canopy development. During this stage, weeds compete intensely for moisture, nutrients, and sunlight, severely restricting vegetative growth.

Failure to control weeds during the establishment phase often results in poor branching, reduced shoot development, delayed flowering, and weak root growth. Since jasmine is a perennial crop, any setback during the early growth stage affects plant performance for several years. Therefore, maintaining weed-free conditions during the initial months is essential for establishing a vigorous and productive plantation.

Even in mature plantations, weed competition increases after pruning. Pruning stimulates the emergence of new shoots and flower-bearing branches, which require adequate nutrients, water, and sunlight for rapid development. If weeds are allowed to grow during this period, they compete directly with regenerating shoots, reducing flowering potential and delaying subsequent harvests. Consequently, timely weed control immediately after pruning is an important component of integrated crop management.

How Weeds Affect Plant Growth

Weeds influence almost every aspect of jasmine growth and development. Their extensive root systems absorb water rapidly, leaving insufficient moisture for the crop. During dry spells, this competition becomes more severe, causing moisture stress that results in reduced shoot elongation, fewer branches, smaller leaves, and delayed flower bud initiation. Continuous moisture deficiency also reduces the plant's ability to absorb nutrients efficiently, thereby lowering overall productivity.

Nutrient competition is another major cause of yield reduction. Fertilizers applied to support continuous flowering are often utilized more efficiently by weeds than by jasmine plants because many weed species exhibit faster growth rates. Nitrogen deficiency caused by weed competition leads to pale foliage and reduced vegetative growth, while phosphorus and potassium deficiencies adversely affect root development, flower initiation, and blossom quality. Micronutrients such as zinc, boron, iron, and magnesium may also become unavailable to the crop due to heavy weed infestation.

Competition for sunlight further aggravates the problem. Vigorous weeds frequently grow taller than jasmine bushes, intercepting sunlight and reducing photosynthesis. Lower carbohydrate production restricts vegetative growth and decreases the number of flowering shoots. Dense weed growth also creates excessive humidity around the crop canopy, favouring the development of fungal diseases such as leaf spot, collar rot, wilt, and root diseases.

Impact on Flower Yield and Quality

The ultimate objective of jasmine cultivation is the production of abundant, fresh, fragrant, and attractive flowers. Weed infestation directly affects both flower quantity and quality. Plants growing under weed competition produce fewer flower buds, smaller blossoms, and shorter flowering periods. Flowers harvested from weed-infested plantations often exhibit reduced freshness and inferior market quality because plants experience continuous physiological stress.

The fragrance of jasmine flowers depends largely on healthy plant metabolism and adequate nutrient availability. Nutrient and moisture stress caused by weeds may reduce the synthesis of volatile aromatic compounds, thereby affecting fragrance intensity. Such flowers are less preferred for garland making, perfume extraction, and premium markets. Harvesting operations also become more difficult in heavily infested fields. Workers require more time to collect flowers because dense weeds obstruct movement between rows and conceal blossoms beneath their foliage. Harvested flowers may become contaminated with weed fragments, dust, and soil particles, reducing their shelf life and market appeal. Consequently, farmers incur additional labour costs while receiving lower prices for their produce.

Weeds as Reservoirs of Pests and Diseases

One of the less recognized but highly significant effects of weeds is their role as alternate hosts for insect pests and disease-causing organisms. Many weeds provide shelter, food, and breeding sites for aphids, thrips, mites, whiteflies, leafhoppers, mealybugs, and nematodes. These pests subsequently migrate to jasmine plants, causing severe infestations during favourable weather conditions.

Similarly, several fungal, bacterial, and viral pathogens survive on weeds between cropping seasons. Dense weed growth also creates a humid microclimate that favours disease development by reducing air circulation and increasing leaf wetness. Therefore, effective weed management contributes not only to higher flower production but also to integrated pest and disease management by eliminating alternate host plants and improving field sanitation.

Economic Consequences of Weed Infestation

The economic impact of weeds extends beyond direct yield reduction. Farmers spend considerable amounts on fertilizers, irrigation, labour, pruning, and plant protection. When weeds utilize a significant proportion of applied nutrients and water, input-use efficiency declines substantially. Additional expenditure is then required for repeated weeding operations, increasing the overall cost of cultivation.

Uncontrolled weeds may reduce flower yield by **30–50 percent**, while severe infestations can result in even greater losses. Increased harvesting time, higher labour wages, poor flower quality, reduced market prices, and greater pest incidence collectively reduce net farm income. In contrast, maintaining a clean and healthy plantation through Integrated Weed Management improves resource-use efficiency, enhances flower quality, and maximizes profitability.

Understanding the biology and behaviour of weeds is therefore essential for developing an effective management strategy. Rather than viewing weeds as a routine nuisance, farmers should recognize them as one of the major factors limiting productivity in jasmine cultivation. A well-planned Integrated Weed Management programme implemented throughout the year can transform weed control from a recurring expense into a profitable investment that ensures sustained flower production and long-term economic returns.