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Weed Management in Fruit and Vegetable Crops: A Review of Herbicide-Based Strategies

Pooja[1], Pravin Sharma[1], Poonam Saini[2], Mukesh Kumar[3], Anuradha[3] and Desh Raj Choudhary[4]

[1]Assistant Professor, CCSHAU College of Agriculture, Bawal, Rewari, Haryana, India
[2]Assistant Horticulturist, CCSHAU RRS, Buria, Yamunanagar, Haryana, India
[3]Assistant Scientist, CCSHAU RRS, Bawal, Rewari, Haryana, India
[4]District Extension Specialist, Krishi Vigyan Kendra, Jhajjar, Haryana, India

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Abstract— *Weeds are considered as undesirable or unwanted due to their competitive nature, providing habitats to various pests and diseases and also have allelopathic effects. Weeds possess some adaptive traits like deep root system and multiple propagation methods like bulbs, corms, rhizomes, stolons etc. which enhance the survival and also their persistence. These characteristics allow them to efficiently exploit resources like water, nutrients and light, often at the expense of crop growth and development. In addition to competing with crops for resources, weeds endanger food safety and the sustainability of agriculture. The removal of nutrients by weeds had a significant effect on the crop's nutritional availability, which in turn affects the buildup of dry matter. The possibility of various herbicides as a successful substitute for weed management techniques is evaluated critically in this review. Because of their effectiveness, affordability, and simplicity of use, herbicides have become an essential component of integrated weed management plans. This review examines the types of herbicides used as pre-emergence and post-emergenceas well as their modes of action, selectivity, and time of application. It concentrates on the role of herbicides in controlling weeds in fruit crops.*

Keywords— ***Weeds, herbicides, competition, fruit crops, integrated weed management.***

I. INTRODUCTION

For sustainable orchard soil management, proper weed control and the preservation of sufficient orchard biodiversity are essential. In order to reduce competition for water and nutrients during the early critical period of tree growth and to boost fruit tree yield, weed control is essential in fruit orchards (Granatstein and Sanchez, 2009). The type and age of plants, kinds of weeds in the orchard, cost and accessibility of labor and materials, type of soil and its fertility, and the farmers' beliefs all play a significant role in selecting the best alternative strategy for sustainable weed management (Hammermeister, 2016). According to reports, poor weed control in apples can result in losses between 36 and 42 percent (El-Metwally and Hafez, 2007). These losses typically arise from decreased production, quality, insect or disease harboring, allelopathic impacts on crops, and disruption of important farm processes including harvesting, fertilizer, herbicide, and weeding. In wide-spaced plantings, weed infestation at the early stages of crop development results in a significant production drop of up to 100% (Nedunchezhiyan *et al*., 2018). Weeds hinder crop growth and productivity by competing for all available resources including space, light and nutrients above ground as well as water and nutrients below ground. Weeds are alternative habitats to many pests and diseases causing organisms. Since it controls the coenoses of orchard agro-ecosystems and becomes a regular component of the agroecological approach in fruit orchards, the idea of weed management has gained a wider definition in recent decades. Weed interference prevents cultivated plants from growing and developing. Additionally, weeds interfere with crops'

ability to grow uniformly, which causes inconsistent crop maturity and makes harvesting more difficult (Yu *et al*., 2019). In addition to competing for resources, certain weed species are home to pests and illnesses, acting as harbors for agricultural pathogens that have the potential to destroy crops (Ahmad Loti *et al*., 2021). Furthermore, weeds can reduce the effectiveness of human and mechanized farming methods, requiring more work and resources to control them (Molinari *et al*., 2020). By precisely targeting and eliminating weed species, reducing labour requirements, and improving crop development, herbicidal compounds made to control and eradicate weeds, have greatly improved crop yields and lessened the negative effects of weed competition (Modi *et al*., 2023). In addition to promoting soil cover to create favourable conditions for a maximum production of high-quality fruits under sustainable premises for soil, water, and fertility management, effective weed management may reduce needless labour and input use and increase crop profitability (Bakshi *et al.,* 2015). When weed pressure is great, farmers only employ herbicides; nevertheless, improper use of these chemicals harms the ecosystem, the soil, and human health (Ansari *et al*., 2021). Despite the fact that herbicides increase crop yields by reducing weeds, their ecological repercussions make them undesirable if applied nonconformistically (Das *et al*., 2024). Although there are herbicides that can be used effectively in a weed control program, no herbicide is effective against every weed. Different herbicides based on modes of action, particularly the application of a combination of herbicides in a single tank or the seasonal rotation of herbicides, have been recommended to combat the proliferation of herbicide-resistant weeds.

Influence of herbicides on weeds

Sharma *et al.* (2000) observed that weed population reduced significantly at 15 days of growth when atrazine was applied as pre-emergence spray as compared to control. Sukhadia *et al.* (2000) found that *Cynodondactylon* and *Cyperus rotundus* could be controlled effectively and economically with the application of glyphosate @ 2.46 kg/ha as compared to other treatments. Nandula and Manthey (2002) observed that carfentrazone used as post-emergence herbicide could control resistant kochia inbreds adequately to excellently. Bal *et al.* (2003) noted that glyphosate @ 4 litres/ha was the most effective herbicide for controlling broad spectrum weeds in winter season crop. For controlling the dicot and monocot weeds glyphosate @ 4 litres/ha closely followed by glycel @ 3 litres/ha and hexuron @ 4 kg/ha was found effective in guava orchard. Josan *et al.* (2003) found that weed population influence the growth of seedlings and application of glyphosate led to better growth of seedlings. Yadav *et al.* (2004) reported that in ber nursery the two prominent weeds, *i.e. Cyperus rotundus* and *Cynodon dactylon* could be controlled 80-98% by glyphosate @ 0.62 and 0.82% up to 90 days after treatment. With the increase in glyphosate rates from 0.20 to 0.82%, the toxicity against *Cyperus rotundus* and *Cynodon dactylon* also increased from 60 to 240 days after treatment. Maji *et al.* (2008) observed that weed control efficiency was found better with the combination of glyphosate @ 0.5 kg *a.i.*/ha and 2,4-D Na salt @ 1 kg *a.i.*/ha which was statistically at par with manual weeding in guava. Granatstein and Sanchez (2009) stated that it is crucial to manage weed in the fruit orchard to diminish competition for water and nutrients during the early critical period of tree growth and to increase productivity of the fruit trees.

Patel *et al.* (2010) found that due to frequent removal of weeds, there were no weeds in the treatment weed free. Minimum number of weeds (monocot and dicot) were obtained in treatment atrazine (2 kg *a.i.*/ha) applied at pre-emergence. Maximum number of weeds was obtained under control in mango seedlings. Kaith and Bhardwaj (2011) suggested that glyphosate (0.5%) and paraquat (0.5%) were found effective in minimizing the population of weeds in apple. Makhija and Singh (2011) observed that weed intensity was found maximum in control and minimum in the treatment atrazine (pre-emergence) + glyphosate (post-emergence) while weed control efficiency was noticed to be maximum in treatment atrazine (pre-emergence) + glyphosate (post-emergence) and minimum in hand weeding in aonla. Jasmine (2012) observed that the number of weeds, fresh weight and dry weight of weeds were found to be minimum with the application of atrazine and glyphosate and maximum in control in ber. Raj *et al.* (2012) noticed that in mango seedling nursery, weed control efficiency, survival rate and number of marketable seedlings were higher under the pre-emergence application of atrazine @ 2 kg/ha. Thakur *et al.* (2012) found that glyphosate was a better post emergence herbicide than paraquat in terms of weed control efficiency when applied after diuron and atrazine. Weed control efficiency was found to be 100 % with the treatment of diuron followed by glyphosate and atrazine followed by glyphosate at 12 weeks after treatment.

Singh *et al.* (2013) observed that in mandarin orchards, weed cause serious threats in *Kharif* season and it has become a challenge to grow and survival for the plant properly due to large weed flora infestation. They reported that isoproturon 75% WP @ 2 % was most suitable among the treatments 2, 4-D, oxyflourfen, glyphosate and imazethapyr to control weeds in orchard

of mandarin. Boora *et al.* (2014) observed that after three months of treatment, weed density was found minimum when pendimethalin was used as post-planting herbicide in guava nursery. The weed biomass of Bermuda grass could be reduced after six weeks of treatment with pendimethalin followed by glyphosate; pendimethalin followed by paraquat; atrazine followed by glyphosate and atrazine followed by paraquat as compared to control treatment during both the years but the weeds could not be eradicated. Lisek (2014) suggested that for managing weeds in the tree row, the standard system is to maintain a 0.6 to 2.0 m wide vegetation free strip, which is managed in most orchards by using chemical herbicides. Kalaichelvi *et al.* (2015) observed that pre-emergence application of oxyfluorfen at 0.25 kg/ha gave higher weed control efficiency followed by hand weeding at 20 days after sowing and pendimethalin (0.75 kg/ha) followed by a hand weeding at 20 days after sowing at different intervals of 10, 25, 40 and 60 days after sowing. Negi (2015) reported that tree growth, fruit yield and quality have been affected due to interference of weeds as they compete for water, light and nutrients in nectarine. Shweta *et al.* (2018) stated that number of weeds was found maximum under the treatment weedy check, while among herbicide treatments lowest number of weeds was found in treatment atrazine 2 kg/ha + glyphosate 1.0 kg/ha in sweet orange.

Patel *et al.* (2010) found minimum dry weight under the treatment atrazine @ 2 kg *a.i.*and maximum under control in mango seedlings. Bal and Kumar (2005) observed that glyphosate @ 1.6 kg/ha as post-emergence application was found most effective in minimizing weed population and dry weight followed by diuron @ 3.2 kg/ha in guava. Boora *et al.* (2014) found that the dry weight of weeds was minimum (0.052) in treatment pendimethalin post-planting @ 1.5 l/ acre with paddy mulch and maximum (32.87) under control in guava. Bhanukar *et al.* (2016) stated that dry weight of weeds was found significantly lowest with the treatment atrazine @ 2 kg + glyphosate @ 1% among the herbicidal treatments at 30, 60, 90 and 120 days after treatment in Kinnow. Singh *et al.* (2005) studied visual mortality of weeds for 10 weeks at 2 weeks interval and found that efficacy of glyphosate was higher when the plots were sprayed during May end and reduced efficacy was observed when sprays were delayed to mid-June in citrus.

Singh *et al*. (2008) reported that among the herbicide treatments, butachlor applied at 1.5 kg/ha resulted in the lowest weed dry weight (4.84 g per 0.25 m²), followed by alachlor at the same rate (6.03 g per 0.25 m²) in radish. Barbaś *et al*. (2020) who found that chemical control of weeds (as weed biomass) in potato was more effective than a mechanical method. In kharif onion, Shinde *et al*. (2013) reported that the highest weed control efficiency (%) in grasses was achieved with the application of Pendimethalin 38.7% CS at 1.75 l/ha, recording 87.41%, 89.26%, and 89.01% at 20, 40, and 60 days after herbicide application, respectively. This was followed by Oxyfluorfen 23.5% EC at 1.0 l/ha, which recorded 80.63%, 81.82%, and 83.52% at the same intervals.

Effects of herbicides on soil health and leafcharacteristicsinfruit crops:

Palma *et al.* (2002) reported that there was a great effect of herbicidal spray on the performance of grape cv. Italia, and vines did not show water and nutrients deficiency symptoms. Rate of carbohydrate leaf assimilation and water status were slightly higher with the application of glyphosate-trimesium + DPX-R-674. Kundu *et al.* (2003) stated that in mulberry plants, the uptake of nitrogen, phosphorous and potassium per unit area by weeds was reduced by the treatment consisting of basalin as pre-emergence combined with gramoxone as post-emergence herbicide at 25 DAP. Paslwar *et al.* (2003) found that nutrients uptake was minimum *i.e.,* nitrogen, phosphorus and potassium after 25 days of weed germination in rainy season with the application of glyphosate 1% + urea 2% while the removal of nutrients *i.e.,* nitrogen, phosphorous and potassium was maximum in control followed by sod mulch in Nagpur mandarin. In citrus orchard, soil organic matter and soil total nitrogen was minimum in herbicidal treatments and maximum in mowed plot (Yang *et al.,* 2007).

The concentration of phosphorous was maximum in leaves and rhizomes treated with herbicide + NPK but among the other treatments there was no significant difference. Pathak *et al.* (2007) recorded stimulatory effect of glyphosate and paraquat on chlorophyll content in guava seedlings. The cholorophyll content was found to be maximum in the seedlings which were treated 20 days after germination and 20 days after sowing with glyphosate. As compared to weeded control, herbicides *i.e.* atrazine and senecor had marginal influence on chlorophyll content. Meena *et al.* (2015) observed that plant leaf nitrogen content was found maximum with grass mulch followed by glyphosate (0.8kg/ha) and phosphorous content was found maximum with pendimethalin (2.0 kg/ha) followed by glyphosate (0.8 kg/ha) and minimum in control inpeach. Shweta *et al.* (2018) found that nitrogen content was maximum under weed free treatment than weedy plants while phosphorous and potassium content was maximum in atrazine (2.0 kg/ha) treated sweet orange. Kumar *et al.* (2020) found the maximum leaf area under mulching with grass, which was statistically at par with pendimethalin 30% EC (Pendamil) @ 2.65l/ha + paraquat

dichloride 24% SL (Gramoxone) @ 2.5l/ha and pendimethalin 30% EC (Pendamil) @ 2.65 l/ha+ paraquate dichloride 24% SL (Gramoxone)@ 3 l/ha, while minimum leaf area was observed under control in plum. Hussain *et al.* (2020) observed that different treatments affected leaf area significantly during the years 2015 and 2016. Maximum leaf area was recorded in paddy straw mulch followed by glyphosate and minimum leaf area was observed under unweeded control among different treatments in apple.

Assessment of herbicides effect on growth and development of fruit crops

Bajwa and Singh (1992) observed that height and diameter of seedlings were maximum under the treatment diuron @ 2.5 and 3.3 kg/ha and number of leaves was found maximum under the treatment glyphosate @2.5 and 3kg/ha in Patharnakh seedlings. Bhutani *et al.* (1988) stated that the height of seedling was maximum with the application of atrazine or diuron both @ 0.5 kg/ha in peach nursery. Josan *et al.* (2003) observed that weed population influenced the growth of seedlings and application of glyphosate led to better growth of seedlings in citrus. Pathak *et al.* (2007) suggested the use of glyphosate and paraquat for effective controlling of weeds in guava seedling, however, in the month of September, *Saccharum spontaneum* weed reappeared in paraquat treatment, and on the other hand, *Kharif* season weeds like *Dichanthium annulatum, Fimbristylis tenera, Trichodesma indicum, Launaea pinnatifida, Crotalaria medicaginea,* could be controlled only by atrazine and senecor. Plant height of guava was increased with the application glyphosate @ 7.5ml/l before sowing and 20 days after sowing, while it was reduced with post emergence application of glyphosate in guava seedlings. Patel *et al.* (2010) found that in mango seedlings, maximum increase in plant height and stem girth was reported with the pre-emergence application of atrazine @ 2 kg *a.e.*/ha. Kumar *et al.* (2020) stated that tree height was maximum with the treatment mulching with grass, which was statistically at par with pendimethalin 30% EC (Pendamil) @ 2.65l/ha + paraquate dichloride 24% SL (Gramoxone) @ 3 l/ha and pendimethalin 30% EC (Pendamil) @ 2.65 l/ha + paraquate dichloride 24% SL (Gramoxone) @ 2.5 l/h and it was minimum in control. Tree spread and volume were not significantly affected by different treatments.

According to Channappagoudar *et al*. (2008), the pre-emergence application of herbicides such as alachlor, pendimethalin, trifluralin, oxyfluorfen, butachlor, and metolachlor in radish significantly enhanced the leaf area index, total chlorophyll content, photosynthetic rate, and nitrate reductase activity when compared to the unweeded control.

Assessment of herbicide effectson fruit characteristics

Bal *et al.* (2003) found the fruit size and weight of guava were significantly improved and highest fruit yield was observed with glyphosate @ 3 and 4 litres/ha. Bal and Kumar (2005) reported that the fruit weight and yield were maximum under glyphosate @ 1.6 l/ha and diuron @ 3.2 kg/ha in guava. Chatha and Chanana (2007) observed that fruit weight was maximum with the treatment oxyflourfen @ 1.01 *a.i.*/ha followed by oxadiazon @ 1.01 *a.i.*/ha and oxyfluorfen @ 0.751 *a.i.*/ha in peach. Samedani *et al.* (2008) suggested that for post-emergence control of broad-leaved and grassweeds, amitrole + ammonium thiocyanate + glyphosate (2.9, 3.6 and 4.3 kg *a.i.*/ha) and new glyphosate (0.54 kg *a.i.*/ha) could be used as suitable option in orchards. Das *et al.* (2010) stated that maximum fruit weight was obtained with the application of glyphosate + 2,4-D (Sodium salt) and minimum was observed in control in guava. Yadav *et al.* (2015) reported that pendimethalin + imazethapyr controlled the major weed flora, which consisted of *Cyperu srotundus*, *Echinochloa crusgalli*, *Commelina benghalensis*, *Phyllanthus niruri* and *Digera arvensis* effectively as compared to application of pendimethalin as pre-emergence, and imazethapyr as post emergence herbicide were equally effective as two hand weedings. Shweta *et al.* (2018) found that number of fruits was highest in treatment weed free and minimum in treatment weedy check in sweet orange.

Komal *et al.* (2019) reported that number of fruits were found maximum with the application of glyphosate @ 1% + pendimethalin @ 1kg/ha and minimum under control. The fruit length, fruit breadth and fruit weight were found to be maximum with the application of glyphosate @ 1% + pendimethalin @ 1kg/ha and minimum fruit length, fruit breadth and fruit weight under control during the month of April, June, August and October in kinnow. Kumar *et al.* (2020) observed maximum fruit length, fruit weight and fruit diameter in mulching with grass, which was statistically at par with pendimethalin 30% EC (Pendamil) @ 2.65 l/ha + paraquate dichloride 24% SL (Gramoxone) @ 3 l/ha, pendimethalin 30% EC (Pendamil) @ 2.65 l/ha + paraquate dichloride 24% SL (Gramoxone) @ 2.5 l/ha and pendimethalin 30% EC (Pendamil) @ 2.65 l/ha + paraquate dichloride 24% SL (Gramoxone) @ 2l/ha, while minimum fruit length and fruit weight were recorded under control. Fruit firmness was recorded maximum under treatment mulching with grass and lowest under paraquate dichloride 24% SL (Gramoxone) @ 2 l/ha.

Bal *et al.* (2003) stated that fruit weight and yield were found to be maximum with the application of glyphosate @ 3 and 4 l/ha in guava. Kaur and Kaundal (2009) studied

different weed management treatments and found fruit weight and yield were maximum under weed free treatment followed by glyphosate @ 1.61 kg/ha as post-emergence and diuron @ 2.4 kg/ha as pre-emergence application. Kaith and Bhardwaj (2011) reported that the maximum yield was observed with the application of glyphosate (0.5%) and paraquat (0.5%) in apple. Steenwerth and Guerra (2012) and Cavender *et al.* (2014) suggested proper weed management is important to minimize weed competition and to assure quality of fruit yield in orchard. Komal *et al.* (2019) observed that yield was found maximum with the application of glyphosate @ 1% + pendimethalin @ 1 kg/ha in the month of April, June, August and October and minimum yield under control in kinnow. Kumar *et al.* (2020) observed that the fruit yield was highest under treatment mulching with grass which was statistically at par with pendimethalin 30% EC (Pendamil) @ 2.65 l/ha + paraquate dichloride 24% SL (Gramoxone) @ 3 l/ha and pendimethalin 30% EC (Pendamil) @ 2.65 l/ha+ paraquate dichloride 24% SL (Gramoxone) @ 2.5 l/ha and lowest in control in plum. Hussain *et al.* (2020) studied different treatments for weed control during 2015 and 2016 and found that maximum fruit yield per tree was obtained with paddy straw followed by glyphosate and minimum under unweeded control during both the years of study in apple.

Influence of herbicides on quality parameters of fruit and vegetable

Maji *et al.* (2008) observed that closer to manual weeding, use of glyphosate @ 0.5 kg *a.e.*/ha + 2,4-D @ 1.0 kg *a.e.*/ha was the most effective practice in guava and all the treatments showed improvement in all the quality attributes of fruits, *i.e.* total soluble solids, acidity and ascorbic acid in comparison to control. Das *et al.* (2010) noted that glyphosate @ 1.0 l *a.i.*/ha + 2,4-D (sodium salt) @ 1200 g *a.i.*/ha treatment was found most effective among various treatment with maximum TSS and ascorbic acid while minimum in control. TSS: acid ratio also increased under this treatment over control in guava. Wali and Jamwal (2014) stated that physico-chemical attributes of strawberry were improved superiorly under the treatment weed free which was at par with the treatment of black polythene and oxyfluorfen @ 0.55 kg *a.i.*/ha. Komal *et al.* (2019) noticed that TSS was maximum under the treatment glyphosate @ 1% + pendimethalin @ 1 kg/ha and minimum under control during the month of April, June, August and October in Kinnow. The acidity was found minimum with treatment paraquat @ 0.6% + pendimethalin @ 1 kg/ha and maximum acidity under control. Ascorbic acid was found maximum with the application of glyphosate @ 1% + pendimethalin @ 1 kg/ha and paraquat @ 0.6% + pendimethalin @ 1 kg/ha and minimum under control in the month of April, June, August and October in Kinnow.

Apurva *et al*. (2018) reported that tomato juice content and total soluble solids (TSS) were highest with hand weeding, which was statistically comparable to the application of pendimethalin immediately after transplanting, pendimethalin one week prior to transplanting, and oxyfluorfen applied immediately after transplanting. Olayinka *et al*. (2017) observed that applying Pendimethalin alone at 4 L ha^{-1}, followed by a combination of Pendimethalin at the same rate and one hand weeding at 6 weeks after planting (WAP), positively affected the fruit quality of tomatoes. Similarly, Engelmann *et al*. (2009) reported that the use of herbicides enhanced lycopene content and improved the overall carotenoid quality in tomatoes.

REFERENCES

[1] Ahmad Loti, N.N., Mohd Noor, M.R. and Chang, S., 2021. Integrated analysis of machine learning and deep learning in chili pest and disease identification. *Journal of the Science of Food and* ***Agriculture*****, 101**: 3582-3594.

[2] Ansari, I., El-Kady, M.M., Arora, C., Sundararajan, M., Maiti, D. and Khan, A., 2021. A review on the fatal impact of pesticide toxicity on the environment and hu man health. *Global Climate Change,* 361-391.

[3] Apurva, M., Punam, H., Sheela, B., Upasani, R.R., Ravikant, R. (2018). Herbicides effect on growth, yield and quality of onion. *Indian J. Weed Sci*. 50 (2):186-188

[4] Bakshi, P., Wali, V.K., Iqbal, **M., Jasrotia**, A., Kour, K., Ahmed, R. and Bakshi, M., 2015. Sustainable fruit production by soil moisture conservation with different mulches: A review. *African Journal of Agricultural Research,* **10**(52): 4718-4729.

[5] Bal, J.S. and Kumar, N., 2005. Effect of various herbicides on the control of weeds in guava orchard. *Haryana Journal of Horticultural* ***Sciences*****,** **34**(1&2):12-13.

[6] Bal, J.S., Dhaliwal, G.S. and Brar, H.S., 2003. Studies on weed control in guava orchard for winter season crop. *Annals of Agricultural Bio Research*, **8**(2): 209-211.

[7] Barbaś, P., Sawicka, B., Marczak, B. **and Pszczółkowski**, P. (2020). Effect of mechanical and herbicide treatments on weed densities and biomass in two potato cultivars. *Agriculture*; *10*, 455.

[8] Bhanukar, M., Preeti and Sindhu, S.S., 2016. Influence of different herbicides on soil and weed parameters in Kinnow orchard. *Research in Environment Life Sciences*, **9**(10): 1190-1193.

[9] Boora, R.S, Dhaliwal, H.S., Singh, J., Bons, H.K. and Arora, N.K., 2014. Studies on weed management in guava (*Psidium guajava*) nursery under north-western subtropical irrigated zone of India. *Annals of Horticulture,***7**(1): 1-5.

[10] Cavender, G., Liu, M., Hobbs, D., Frei, B., Strik, B. and Zhao, Y.,2014. Effects of different organic weed management strategies on the physicochemical, sensory, and antioxidant properties of machine-harvested blackberry fruits. *Journal of Food Science*, **79**: 2107-2116.

[11] Channappagoudar BB, Koti RV, Biradar NR and Bharmagoudar TD. (2008). Influence of herbicides on physiological and biochemical parameters in radish. *Karnataka Journal of Agricultural Science*, 21 (1):8-11

[12] Chatha, R.P.S. and Chanana, Y.R., 2007. Studies on weed management in young peach orchards. *Indian Journal of Horticulture*, **64**: 300-303.

[13] Das, B.C., Mulieh S.R. and Maji**,** S., 2010. Effect of herbicides and hand weeding on weed control in guava cv. L-49. *Journal of Crop and Weed,***6**(1):59-63**.**

[14] Das, T.K., Behera, B., Nath, C.P., Ghosh, S., Sen, S., Raj, R., Ghosh, S., Sharma, A.R., Yaduraju, N.T. and Nalia, A., 2024. Herbicides use in crop production: An analysis of cost-benefit, non-target toxicities, and environmental risks. *Crop* ***Protection*****, 181**:106691.

[15] El-Metwally, I.M. and Hafez, O.M., 2007. Comparative study of some weed control treatments on different weeds grown in anna apple orchards. *Arab University Journal of Agricultural Science*, **15**: 157-166.

[16] Granatstein D., Sanchez E. (2009): Research knowledge and needs for orchard floor management in organic fruit system. *International Journal of Fruit Science,* **9**: 257-281.

[17] Hammermeister A.M. (2016): Organic weed management in perennial fruits. *Scientia* ***Horticulturae,*** **208**: 28-42.

[18] Hussain, S., Sharma, M.K., Rasheed, A., War and Hussain, B., 2020. Weed management in apple cv. Royal Delicious by using different orchard floor management practices. *International Journal of Fruit* ***Science,*** **20**(4): 891-921.

[19] Jasmine, A.J., 2012. Weed management in ber (*Ziziphus jujuba* L.). *Asian Journal of Horticulture,* **7**(2): 315-317.

[20] Josan, J.S., Sharma, J.N. and Monga, P.K., 2003. Effect of various herbicides on weed population in citrus nursery. *Indian Journal of Horticulture*, **60**(1): 45-48.

[21] Kaith, N.S. and Bhardwaj, J.C., 2011. Effect of different herbicidal concentrations on weed density, tree growth and fruit yield of "Starking Delicious" apple. *Agricultural Science Digest,* **31**(2):126-130.

[22] Kalaichelvi, K., Sakthivel, S. and Balakrishnan, A., 2015. Integrated weed management in groundnut. *Indian Journal of Weed Science*, **47**(2): 174-177.

[23] Kaur, K. and Kaundal, G.S., 2009. Efficacy of herbicides, mulching and sod cover on control of weeds in plum. *Indian Journal of Weed Science*, **41**: 110-112.

[24] Komal, Godara, R.K., Reetika and Pooja, 2019. Repeated application of herbicide mixtures effect on fruit, yield and quality of Kinnow. *Journal of Pharmacognosy and Phytochemistry*, 268-270.

[25] Kumar, R., Sharma, D.D., Singh, G. and Singh, N., 2020. Effect of different weed management practices on growth, yield and fruit quality of plum (*Prunus salicina*) cv. Red Beauty. *Journal of Crop and Weed,***16**(3): 216-220.

[26] Kundu, C.K., Sinha, A.C., Mondal, B.B. and Jana, P.K., 2003. Effect of weed control measures on uptake of NPK by weeds and mulberry plants. *Journal of Interacademicia*, **7**(4): 484-488.

[27] Lisek, J., 2014. Possibilities and limitations of weed management in fruit crops of the temperate climate zone. *Journal of Plant Protection Research*, **54**(4): 318-326.

[28] Maji, S., Das, B.C. and Bandyopadhaya, P., 2008. Studies on weed management practices in guava cv. L-49. *Journal of Crop and Weed*,**4**(2): 52-56.

[29] Makhija, M. and Singh, S., 2011. Weed management studies in aonla. *Haryana Journal of Horticultural* ***Sciences*****, 39**(3-4): 185-187.

[30] Meena, M.K., Sharma, D.D. and Meena, O. P., 2015. Effect of different weed management practices on weed population, yield potential and nutrient status of peach cv. July **Elberta.** ***Research*** *on* ***Crops*****, 16** (3): 519-525.

[31] Modi, R.U., Kancheti, M., Subeesh, A., Raj, C., Singh, A.K., Chandel, N.S., Dhimate, A.S., Singh, M.K., Singh, S., 2023. An automated weed

identification framework for sugarcane crop: a deep learning approach. ***Crop Protection,* 173: 106360.**

[32] Molinari, F.A., Blanco, A.M., Vigna, M.R., Chantre, G.R., 2020. Towards an integrated weed management decision support system: a simulation model for weed-crop competition and control. *Computers and Electronics in Agriculture,***175**: 105597.

[33] Nandula, V.K. and Manthey, F.A., 2002. Response of kochia inbreds to 2,4-D and Dicamba. *Weed Technology*, **16**: 50-54.

[34] Nedunchezhiyan, M., Laxminarayana, K. and Chauhan, V.B.S., 2018. Soil microbial activities and yield of elephant foot yam as influenced by weed management practices in alfisols. *International Journal of Vegetable* ***Science,* 24**(6): 583-596.

[35] Negi, P., 2015. Effect of orchard floor management practices on growth, cropping and quality of Nectarine [*Prunus Persica* (L.) Batsch var. Nucipersica] cv. Snow Queen. M.Sc. Thesis, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan.

[36] **Olayinka, B.U., Esan, O.**O., Anwo, I.O. and EtejereE.O. (2017). Comparative growth analysis and fruit quality of two varieties of tomato under hand weeding and pendimethalin herbicide. *Journal of Agricultural Sciences*. 12 (3) Pp 149-161.

[37] Palma, L., Novello, V., Montemurro, P. and Gisell, A., 2002. Ecological and agronomic response of *Vitis vinifera* L. cv. Italia to different techniques of soil management. *Italus Hortus*, **9**(4): 15-22.

[38] Paslwar, A.N., Gade, R.M., Gawande, R.P. and Shingrup, P.V., 2003. Studies on weed control in Nagpur mandarin. *Annals of Plant Physiology*, **17**(2): 201-202.

[39] Patel, B.N., Patel, N.N. and Raj, V.C., 2010. Influence of different weed management practices on growth of mango seedling. *The Asian Journal of* ***Horticulture,* 5**(1): 89-92.

[40] Pathak, S.M., Singh, D.K. and Singh, V.K., 2007. Effect of herbicides on growth, weed infestation and physio-biochemical changes in guava (*Psidium guajava* L.) seedling. *Acta Horticulturae,* **735**: 315-320.

[41] Raj, V.C., Patel, D.D., Thanki, J.D. and Arvadia, M.K., 2012. Effect of weed management in mango seedling nursery. *Bioinfolet*, **9**(4): 594-595.

[42] Samedani, B., Maknali, A. and Mamnoii, E., 2008. Evaluation of some post emergence herbicides in orchards of Iran. *Pakistan Journal of Weed Science Research*, **14**(3-4): 161-168.

[43] Sharma, A.R., Toor, A.S. and Sur, H., 2000. Effect of interculture operations and scheduling of Atrazine application on weed control and productivity of rainfed maize (*Zea mays* L.) in Shiwalik foot hills of Punjab. *Indian Journal of Agricultural Sciences*, 70(1): 757-761.

[44] Shinde, K.G., Bhalekar, M.N. and Patil, B.T.(2013). Effect of herbicides on weed intensity, weed control efficiency and yield in Kharif onion cv. Phule Samarth. *Vegetable Science*; 40 (1): 93-95

[45] Shweta, Rana, G. S., Duhan A. and Kaur, A., 2018. Evaluation of different herbicides on weed control, yield and quality of Sweet orange. *Chemical Science Review and Letters*, 7(26): 528-532.

[46] Singh, M., Prabhukumar S., Sairam C. V. and Kumar, A. (2008). Effect of different herbicides on weed management in radish. *Indian J. Weed Sci*., 40 (1 & 2): 96-97

[47] Singh, J., Bhatnagar, P. and Singh, B., 2013. Effect of weedicide in minimization of weed menace in Nagpur mandarin orchard. *Hort Flora Research Spectrum*, **2**(2): 178-179.

[48] Singh, S. and Singh, M., 2005. Efficacy of carfentrazone tank mixed with glyphosate and paraquat against citrus weeds. *Proceedings Southern Weed Science Society*,**58**: 152.

[49] Steenwerth, K. and Guerra, B., 2012. Influence of floor management technique on grapevine growth, disease pressure and juice and wine composition: A Review, *American Journal of Enology and Viticulture*, **63**: 149-164.

[50] Sukhadia, N.M., Ramani, B.B., Asodaria, K.B. and Modhwadia, M.M., 2000. Efficacy of herbicides on *Cynodondactylon* and *Cyperus rotundus* control under non crop situation and it's after effect on succeeding summer green gram. *Indian Journal of Weed Science,***32**(3-4): 160-163.

[51] Thakur, A., Singh, H., Jawandha, S.K. and Kaur, T., 2012. Mulching and herbicides in peach: Weed biomass, fruit yield, size, and quality. *Biological, Agriculture & Horticulture*, **28**(4): 280-290.

[52] Wali, V.K. and Jamwal, K., 2014. Impact of integrated weed management practices on physico-chemical attributes of strawberry (*Fragaria x* ***ananassa* Duch.**) cv. Chandler. *Progressive Horticulture*, **46**(1): 31-33.

[53] Yadav, A., Balyan, R.S., Malik, R.K., Bhatia, S.K. and Banga, R.S., 2004. Management of weeds in ber nursery. *Haryana Journal of Horticultural Sciences*, **33**(3/4): 202-203.

[54] Yadav, K.S., Dixit, J.P. and Prajapati, B.L., 2015. Weed management effects on yield and economics of blackgram. *Indian Journal of Weed Science*, **47**(2): 136-138.

[55] Yang, Yisong, Wang, H., Tang, Jianjun and Chen, X., 2007. Effects of weed management practices on orchard soil biological and fertility properties in southeastern China. *Soil & Tillage Research*, 179-185.

[56] Yu, J., Sharpe, S.M. and Boyd, N.S., 2019. Fumigants alone or in combination with herbicide for weed management in bell pepper (*Capsicum annuum*). *Crop Protection,* **118**: 31-35.