

August: Agricultural activities

Seema Sepat¹ and Dinesh Kumar²

Division of Agronomy, ICAR-Indian Agricultural Research Institute, New Delhi 110 012

The sowing operations of all kharif crops may have been finished by the end of July. If it has not been done yet due to scanty rainfall or for any other reasons, then ensure sowing in the first week of August, particularly for pulses like blackgram. This year monsoon is delayed, therefore, whatever amount of rainfall is received, it needs to be conserved and utilized properly. Ensuring proper bunds around the field is necessary to capture the rainwater in the field. In case of excess water in all crops except rice, proper arrangements for drainage need to be made. Weed removal is required for better vigour of crops. Infestation of insect-pests should be monitored regularly.

Key words: Iron deficiency, Insect-pests, *Kharif* crops, Plant protection

AUGUST is a critical month for better stand and growth of crop plants. In different crops, zinc deficiency can occur, which has to be overcome essentially for better plant growth. Therefore, in this article, important agricultural activities in August are discussed.

Care of *kharif* rice

The transplanted rice requires regular water supply for higher yields. Proper irrigation is needed and about 5- cm height of standing water must be maintained for good growth of rice. Crop develops zinc deficiency symptoms in zinc deficient soils called *khaira* disease. In zinc deficient crop, chocolate-brown spots develop on the lower leaves of rice plant. These spots increase in size and merge into each other to produce completely brown leaves. Tillering is drastically affected by zinc deficiency. Spraying 0.5% ZnSO_4 +0.25% unslacked lime 2-3 times should be done 15-20 days interval to control zinc deficiency.

Damage by several insect-pests can also be seen in July. The larvae of stem borer can damage the rice crop during the panicle initiation stage. The symptom of stem borer infestation before the panicle initiation stage is known as “dead hearts” and after panicle initiation as “white ear”. Pheromone traps can be used for controlling stem borer. Five pheromone traps in one-hectare land are needed to control the stem borer. Use of *Trichogramma japonicum* trichocard at 1-1.5 lakh/ha/week is suggested after 30 days of transplanting. This needs to be repeated every 2-3 weeks depending upon the requirement. Broadcasting of carbofuran 3G or cartap hydrochloride 4G or fipronil 0.3 at 25 kg/ha can be done to manage this insect. Furthermore, spraying of *chlorpyrifos* 20 EC at 2 ml/litre of water or quinalphos 25 ES at 2 ml/litre of water or cartap



Fig. 1. Severe leaf folder infestation in rice

hydrochloride 50 SP at 1 ml/ litre of water can also be done. Infestation of leaf folder can also influence the growth of rice crop. The larvae of leaf folder sieves, webs and folds both sides of rice leaves and thereafter eat the green part of the leaves (Fig.1). The crop appears dry in case of high infestation. The vital aspects of insect-pests management in rice are:

- Do not use excessive amount of fertilizers. Follow balanced and optimum fertilization schedule for higher growth of rice crop.
- Use pheromone traps to monitor the insect-pests infestation.
- Frequently monitor insect-pests and use pesticides when population exceeds the critical limit of threshold.
- Encourage natural enemies of insect-pests, such as spiders.
- Prefer granular forms of insecticides as they are less harmful to human health over liquid formulations.

In rice, bacterial blight can harm the crop from initial growing phase to ripening stage. Therefore, proper control needs to be undertaken. In this disease, the upper tips of leaves start drying which can extend up to middle part of the leaves. The dried yellow leaves sometimes show light brown spots as well. In case of high infestation, whole leaf may dry-up. Generally, no grain formation occurs in the infected panicles. On the appearance of this disease, use of nitrogen fertilizers should be stopped because it spreads infection. Do not allow the flow of irrigation water from infested field to the unaffected field. Meanwhile, do not irrigate the infested crop. Proper drainage in the field can reduce blast infestation. Spraying of 100 g agrimycin and copper oxychloride 500 g dissolved in 500 litres water for one ha area should be done. This spraying should be repeated 3-4 times. First spraying at the appearance of disease, and thereafter it should be done at 10 days interval, depending on the infestation.

Managing better growth of maize, pearl millet and sorghum

In sorghum, apply the remaining amount of nitrogen after 30-35 days of sowing. In case of rainfed

sorghum, spraying of 2% urea in 1,000 litres water in standing crop is beneficial for higher yield. Besides major nutrients, micro-nutrients are also essential for higher yield in sorghum. Iron and zinc are the major micro-nutrients for sorghum. Foliar spray of 0.2% of zinc and 0.15% of iron can be done at 30-40 days after sowing. The sorghum should be kept weed free, particularly up to the critical period of crop-weed competition, i.e. upto 30-45 days after sowing. About 2-3 hand weedings are required to control the weeds. In general, sorghum cultivation is done in unirrigated regions. In *kharif* season, if there is no rainfall then ensure proper irrigation. In sorghum, growth, flowering, heading and grain filling stages are critical. Therefore, irrigation is required during all the above-mentioned critical stages. The growth and yield of sorghum will be greatly affected if no irrigation is done at these stages. Irrigation and proper water drainage are needed for the growth of sorghum. Standing water in the field for longer period is detrimental for sorghum. Therefore, drain excess water immediately from the field.

Weeding is needed for better crop growth. Hand weeding enhances crop growth and soil aeration which enhances root growth and conserves soil water. Harrowing through tractor or hand hoeing can be done

after three weeks of sowing. Infestation by insect-pests can adversely influence sorghum yield. The larvae of stem borer cut the middle part of the growing stem, thus growing tip of the stem dies in severe infestation. This insect usually appears 15 days after sowing and head formation stage. It makes tunnels in the stem and chews the soft part of the stem; therefore, growing part of the stem dies which is known as the “dead heart”. Broadcasting of carbofuran 3G at 15 kg/ha should be done 25 days after sowing. Stem fly is yet another important insect-pest in sorghum. It occurs 7 to 30 days after sowing. The larvae of stem fly cut the plant at initial stage, thus plant dies. Application of carbofuran 3G at 20 kg/ha should be done at the time of sowing.

Irrigation at flowering stage of pearl millet is beneficial. Proper soil moisture needs to be maintained at tillering, earhead formation and grain formation stages. Pearl millet is also sensitive to water stagnation. Therefore, ensure that no water stands in the field for longer periods of time.

In maize, remaining half amount of N in two equal splits should be broadcast applied at knee high and tasseling stages. In case of light texture soil, nitrogen can be divided into four equal parts at sowing, knee-high stage, tasseling and silking stage.



Fig. 2. Ideal population for good growth

It is also necessary to remove the excess plants by thinning operation to get the ideal plant population (Fig.2). In case of no rainfall, proper irrigation needs to be ensured for higher yield. The tasseling and silking stages are the critical stages for irrigation. Proper water drainage is also needed besides proper irrigation in maize. Maize sown on raised bed or flat-beds needs proper drainage of excess water.

Cultural operations and plant protection in pulses

Pigeonpea (arhar), lobia (cowpea), greengram (mungbean) and blackgram (urd) are the important pulses during *kharif* season. Pulses cannot tolerate water stagnation in the field. Therefore, proper drainage of excess water is vital. On the other hand, if there is no rainfall then ensure irrigation at critical stages. In case scattered and uneven rainfall prevails for longer period, then apply one irrigation at pre-flowering stage of pigeonpea. Second irrigation can be applied at pod formation stage. In pigeonpea, weeds need to be controlled at least up to 45-50 days after sowing. Hand weeding 30 and 45 days after sowing can control weeds, and thereafter crop is able to suppress the weed growth.

The larvae of *Helicoverpa* can damage greengram and blackgram. *Helicoverpa* larvae eat pods while tobacco larvae feed on the plant leaves. Five pheromones in one hectare land are required to monitor the pest. Spraying of BT or HNPV should be done. Deltamethrin (1 ml/ 1 litre of water) spray should be done according to the critical level of pest infestation. Pick the larvae and if possible destroy the eggs. NPV spray should be done based on the need. Yellow mosaic sometimes becomes a serious threat in greengram and blackgram (Fig.3). In this case, use of resistant variety is suggested at sowing. The young and growing leaves develop the symptoms of yellow mosaic. The infected leaves remain short and rarely form the pod. The seeds of affected plants remain shrivelled and smaller in size. Disease spreads through white fly, hence its control is needed. Spraying of



Fig. 3. Symptoms of yellow mosaic virus in mungbean

deltamethrin or imidacloprid at 0.02% should be done to control white fly. Total 3-4 sprayings can be done at an interval of 15-20 days. In greengram and blackgram, *Cercospora* spot disease is yet another important disease. Circular, oval, boat shape spots of 0.5-4 mm (average 3-4 mm size) develop on the leaves. Purple-red coloration develops on leaves, which later on turns dark brown on severe infestation in the middle part of the leaves. Spraying of bavistin at 0.05% or zineb at 0.2% should be done in case of severe infestation.

Lobia (cowpea) does not require frequent irrigation. However, in case of long and dry spell, the crop should be supplied with irrigation water. The flowering and pod formation stages are the most critical one. The deficiency of irrigation at these stages can hamper yield. The red hairy caterpillar is important insect-pest of lobia which can damage the crop. Young larvae (caterpillar) cut the plant and eats green part of the leaves. Sometimes, resowing of the crop may be required, especially in case of severe infestation. The eggs and larvae of caterpillar should be picked and destroyed in the field. Application of 25-30 kg/ha of methyl parathion 3G should be done. Leaf hopper, jassids and aphids suck the cell sap of the plant which turns plant yellow and weak. Spraying of

dimethoate 30 EC at 2 ml dissolved in one litre water should be done. Infestation of bacterial blight can damage lobia crop during initial stages. Appearance of dark green small circles can be spotted on the leaves and sometimes leaf fall may occur with increased infestation. Use of resistant varieties and spraying of 0.2% blitox is suggested to reduce the incidence of this disease.

Field operations in oilseeds

Groundnut, soybean and sesame are the important oilseed crops of *kharif* season. In groundnut, proper weed control is required otherwise crop yield reduction up to 30-50% may occur. The groundnut crop should be kept weed free at least up to 25-40 days after sowing for higher yield. In groundnut, first hand weeding 25 days after sowing and second 40-45 days after sowing should be practiced to control the weeds and provide proper aeration. In general, the entire *kharif* crop depends on the rainfall. Ensure proper irrigation at flowering, pegging, pod and seed formation stages in case of scanty rainfall. If there is high amount of rainfall then ensure proper drainage of excess water.

The white grub is a serious insect-pest of groundnut. The young larvae of white grub feed on the plant roots which turn the crop dry and pale



Fig. 4. Early symptoms of iron deficiency

yellow. Adult white grub appears on the trees and thereafter, during the rainy season moves to the field for egg laying. Thus, adult should be picked and destroyed so as to avoid egg laying in field. Broadcast application of carbaryl 50 WP at 4 g in one litre water or monocrotophos 36% SL at 1.5 g dissolved in one litre water or chloropyriphos 20 EC at 1.5 ml in one litre water should be done. Tikka is a major disease of groundnut. Appearance of round, small brown spots on the lower leaves of the plant indicates infestation. Higher infestation increases the number and size of the spots on the leaves which may extend up to branches and stem of the plant. Spraying (2-3 time) of dithane M 45 at 0.2% should be done. Another problem in groundnut is the occurrence of iron deficiency, particularly in calcareous (>7.5 pH) soils. The yellowing between the veins of new leaves are the typical symptoms of iron deficiency in groundnut (Fig.4). Foliar application of 0.1% Fe either through iron sulphate, Fe-EDTA or iron citrate could be used to overcome the iron chlorosis. In general, 3-4 foliar sprays are required at 15-20 days interval to overcome iron chlorosis.

In soybean, weed infestation can reduce the yield in high rainfall regions. Weeds can reduce crop

production up to 30-70%. Hand weeding can be done to control the weeds. In soybean, irrigation scheduling should be done based on the soil type, temperature and rainfall amount. If dry spell extends, then ensure proper irrigation to avoid moisture-stress. Initial growth stage, flowering and seed formation are the critical stages of soybean for irrigation. Therefore, ensure proper irrigation at these stages. Water stagnation can harm the crop, therefore, ensure proper drainage.

In soybean, red hairy caterpillar and pod fly are the important insect-pests. These pests reside in the soil, therefore, apply phorate 10G at 10 kg/ha during the sowing period. Broadcasting of thiamethoxam 25 WP at 100 g/ha should be done. Spraying of quinolphos 25 EC at 1.5 l/ha should be done to control the pod fly. Soybean crop is also affected by many diseases, especially by *Myrothecium*, *Cercospora* spot and *Rhizoctonia* aerial blight. Apply carbendazim 50 WP or thiophanate methyl 70 WP at 0.5 kg dissolved in 700-800 litre water for one ha, at 35 and 50 days of sowing. Spraying of oxychloride at 2 kg + *Streptomycin* at 200 g/ha, dissolved in 700-800 litre water can be done to control bacterial induced disease.

Weed infestation can adversely affect the growth of sesame crop.

Therefore, ensure weed free condition up to 25-30 days after sowing to obtain higher yield. In general, two hand weeding are required, first 15-20 days and second 35-40 days after sowing. In sesame, leaf minor and pod fly are the important insect-pests. These pests feed on the leaves, flower and young pods. Spraying of quinalphos 25 EC at 1.5 l/ha should be done at flowering and at pod formation stage depending on the severity of infestation. In some areas, sesame phyllody could occur as a threat and can harm the crop severely. The symptoms of this disease appear during flowering stage. Infested plants develop bunchy green leaves instead of flowering. Uproot and throw the diseased plant from the field. Late sowing should be preferred if phyllody infestation occurs frequently.

Important principles of conservation agriculture (CA)

Conservation agriculture (CA) is a technique to enhance crop productivity and soil health with the reduction of cultivation cost. CA effectively conserves and utilizes the natural resources. Therefore, CA can make agriculture sustainable and beneficial over a longer period of time. The main objective of CA is to secure the livelihood of small and marginal farmers. CA has three principles: minimal disturbance of soil, retention of crop residues and, crop diversification.

Minimal disturbance of soil

The first principle of CA is minimal disturbance of the soil. It is obtained through zero tillage. In the zero planting techniques, crops are sown without cultivation of field by a special type of zero seed drill (happy seeder or turbo seed drill). Crops such as wheat, maize and pigeonpea can be sown very easily in standing crop residues by the happy seeder. Zero-tillage sowing has been proven effective in maize, pigeonpea, pearl millet and wheat.

Zero tillage promotes timely sowing of the crops, reduces the cost of cultivation as less fuel is required because tillage is confined to sowing only. CA is reported to enhance 5-

10% yield in comparison to traditional sowing. Less expenditure occurs on labour and fuel requirement in comparison to conventional agriculture. In zero-tillage, less mechanical manipulation of soil does not put pressure on the lower surface of the soil. Therefore, bulk density and penetration resistance of the soil decreases which promotes root development. The decomposition of organic matter is low in zero-tillage compared to intensive tillage practices which enhances the soil biological activity and build-up of organic matter in the soil.

Crop residue retention

Covering the crop residue on the soil surface is another important basis for CA (Fig.5). In this way, organic matter is formed in the soil and there is an increase in soil biological activity. Maintaining the crop residues on the soil surface preserves moisture and moderates the fluctuations in the soil temperature. Therefore, nutrients and moisture are available in balanced quantities to the crop. On the other hand, retention of crop residue on the surface of the soil reduces soil erosion and improves water infiltration into the soil.

Crop diversification

Crop Diversification is the third important principle of CA. Under diversification, instead of growing the same crop for successive years like continuous paddy cultivation in *kharif*, pigeonpea and cotton can be grown as they are found to be equally remunerative. Inclusion of pulses in the existing crop rotation such as summer greengram in rice-wheat cropping system is another way of sustainable crop intensification. Today CA is considered as a popular medium of sustainable agriculture. The total area under CA in the world is 116 million ha, in which more than half is in South America. It has been observed that by adopting CA, crop production can be increased by increasing the nutrient use capacity



Fig. 5. Sowing of cotton in wheat residue retained field

up to 10%. CA is the need of the hour to protect the environment and human health.

Protection of sugarcane

The growth of sugarcane is very fast during the August month. The moist or waterlogging conditions in soil and higher wind speeds in August further encourage crop lodging. The tying of sugarcane leaves must be completed during the previous month. Irrigate the crop in case of long dry spell. Both, irrigation and removal of excess water during rainy season become important practices in sugarcane. The stagnation of water may reduce the exchange of gases in the soil. Therefore, oxygen amount may reduce while carbon dioxide may increase in the soil. In addition, the number of beneficial micro-organism may reduce which will decay the roots. This phenomenon can reduce sugarcane growth and sugar recovery. The most active secondary roots decay. The primary roots also darken and start to decay. The leaves become pale and rate of photosynthesis gets affected. Remove excess water from the field through proper drainage facility.

Insect infestation may occur during this month. In sugarcane, total 72 types of insect-pests occur out of which 10 insects are most dangerous. The pupae of sugarcane top borer are light creamy white and adult are bright white in colour. It does not have stripes on the body. The larvae are most active during the

months of July to October and make holes in the middle veins of the leaves. First, it damages the outside whorl of leaves and then reaches the young growing leaves. *Trichogramma japonicum* 4-6 times may be used at 25-30/ha. Tricho card should be repeated after 10 days interval, depending on the invasion of pest. Staple the Tricho card on the lower leaves during the morning hours. Sugarcane stem larvae

enter through leaves to the stem. First, it eats the leaves and then makes hole in the stem of the crop plant. Adopt the similar control measures as suggested for the sugarcane top borer. Gurdaspur borer is yet another insect which causes significant losses in plant growth. It has four purple stripes on the body, and is active during June to September. The borer starts feeding on top part of the leaves and moves down the stem. Follow the control measures as suggested for the sugarcane top borer.

Sugarcane crop also gets damaged by many diseases. In sugarcane, about 13 types of diseases may occur. Among disease, red rot is the most serious one. Upon infestation, 3-4 leaves from the top dry up and therefore, whole upper part appears dry. The tissue of sugarcane stem turns red with white long stripes. The middle veins of the leaves may have red spots. Do not use infested crop stem cuttings for sowing. Dip the healthy stem cuttings into aretan at 0.25% solution for 5 minutes before sowing. Use the resistant varieties for sowing purpose.

Protection of cotton

Cotton is fast and profusely growing crop. Crop lodging may influence its yield and quality, and may also harm the root system. Thus, nutrient absorption may be affected and finally crop growth. It is advisable to protect the cotton crop from lodging caused mainly due to the accumulation of excess water in



Fig. 6. Cotton crop free from weeds, insect-pests and diseases

the field. Therefore, earthing up operation should be accomplished within 60 days after sowing. This can be done through country plough or hand hoe. This practice also helps in reducing weed growth. Proper soil moisture must be maintained at flowering and boll formation stages for higher yield, otherwise, flower drop may occur. If vegetative growth is excessive than stop watering or light irrigation should be given to the crop. Crop should be kept weed-free (Fig. 6).

Heavy irrigation at flowering stage may induce excessive vegetative growth and boll formation gets delayed. Cotton is very sensitive to water stagnation. Therefore, ensure proper drainage. In cotton, bollworm, sucking pest and leaf folder pests can do significant harm. Leaf minor pest in cotton webs the leaves and eats the inner content of leaves. Use parasitoides tricho card to control this insect-pest. Use pesticides according to the critical level of pest infestation. In cotton, pink bollworm, American bollworm and spotted bollworm may damage the crop. The control of bollworm may be done as mentioned below.

- Crop should be kept free from weeds.

- Destroy the stubbles of previous cotton crop.
- Use resistant varieties and do not delay sowing of the crop.
- After every 9-10 rows of cotton, one line of *Setaria* may be sown as it attracts the natural enemies of the bollworm.
- Use different pheromones for different types of pests.
- Use 3 pheromone trap in one ha land to monitor the bollworm infestation.
- Spray 5% neem seed kernel extract 45-55 days after sowing
- Spray of NPV 250 LE/ha needs to be done to control the bollworms and repeat the spray at 15 days' interval.
- Use BT at 1.5 l/ha

Use insecticides according to the crop infestation. Chlorpyrifos, profenofos, triazofos should be used according to the recommended amount in the crop. Disease infestation may harm the cotton crop. Root rot is the major disease in cotton. Besides this, many bacterial, or viral diseases may harm the crop. Root decay in case of root rot. Early sowing should be preferred and intercropping with moth crop also reduces root rot infestation. Use resistant varieties to control the wilt.

Cultural practices in vegetables

- Remove excess water from the vegetables in case of heavy rainfall.
- Hand hoeing should be done in brinjal if planted during last month. Apply the remaining amount of nitrogen in brinjal.
- The ripened fruits of okra and brinjal should be picked and sold in the market
- Apply 60 kg/ha urea in chilli and tomato transplanted during July month. Hand weeding may be done to manage the weeds.
- For early planting of cole crops, seeds may be sown in nursery during this month.
- Apply 75-80 kg/ha urea in okra sown during the last month. Yellow mosaic can harm the okra. If so then remove the infected plants. This disease spreads through whitefly. Spraying of metasystox 25 EC or dimethoate 30 EC at 0.05% should be done to control the whitefly.
- Sowing of Pusa chetaki variety of raddish can be done in this month.

Cultural practices in fruits, flowers and plantation crops

- Remove the excess water and unwanted plants from the flowers.
- Transplanting of papaya must be completed in this month.
- Use malathion at 0.1% to control the fruit fly in guava. The fruits must be picked up at least 15 days after the insecticide spray.
- In oranges, use 10 ppm 2,4-D to check the flower drop. Use 1 g of 2,4-D in 100 litres water for preparing 10 ppm solution.
- In lime and litchi, grafting should be completed in this month.
- Cut the sprouted branches of grapes at 1 m length. Control the leaf-eating caterpillar in the grapes. Use bavistin 50 WP at 0.2% to control the fungal diseases in the grapes.
- Keep the pits free from weeds in newly planted orchards.

¹Senior Scientist, ²Principal Scientist, Corresponding author: seemasepat12@gmail.com

It pays to advertise in **Indian Farming**