

Importance of Plant Protection in Crop Production*

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The slogan 'Grow more food crops' has now-a-days become so very infectious that at present we hear it from all corners and even from quarters where talk about such subjects connected with the boorish farmer of the uncivilised rural areas is generally considered outlandish and tabooed in high and refined social circles. It is, however, encouraging to note that persons in all walks of life are now beginning to realise the grim fact that the half-naked and ill fed farmer toiling in the out of the way fields and forests is the individual who has to satisfy the vital needs of every human being, be he a prince or peasant. In this particular aspect anyway, the present unfortunate world conditions have contributed to remind us all that it is on the foundation of agriculture that all human activities and thoughts depend in the last resort. The war and the events which have followed have demonstrated with great force the absolute dependence of all phases of industrial life upon the single industry agriculture, which, with its associated activities, forms the one primal, all-essential requisite in the successful prosecution of any enterprise whether war or peace. In the words of Prof. Maskew "the most important, the most vital thing in all the world is to get something to eat; if all of us here present, or mankind in general, were positively unable to obtain anything to eat for the space of one week, the affairs of this world, commercial or otherwise, would soon become of no more consequence than duckweed upon the surface of a pond. Without something to eat there would be no coal mined, no steel forged, no freight cars rolling. Agriculture in its broadest sense is the source of something to eat, and hence the original source of all subsequent action." As is usually the case sheer necessity is now driving us to evolve ways and means to provide the essential food materials which are getting insufficient and very costly as days pass. The suggestions to grow more food crops, to replace as far as possible other crops by cereals and pulses and to utilise all available cultivable space for such purposes are certainly commendable and every land owner and farmer will be well advised in following such laudable suggestions. It need hardly be added that in order to utilise all available areas to grow more food crops and to reap the benefits of such an endeavour several things are essential. Among these are the grant of land to poor farmers who are willing to take up such work either free or on very attractive conditions, freedom from Government taxes or liberal concessions in that direction, the supply of cheap seeds, free irrigation wherever available and even the loan of implements and cattle in many cases. Granting that all these facilities are arranged for and the ryot starts operations he has to remember that his duties do not end there; for in crop production the protection of the growing crops from the depredations

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of the various agencies which cause it harm is a very important problem deserving as much attention as other aspects of the work to ensure his obtaining the expected harvest. For, inspite of the best attentions paid to the cultural, manurial and other requirements of the crop in the absence of proper protection the crop might often suffer severely at the hands of pests of different kinds. And especially so is the case when food crops are grown on a very wide scale all over the country and thereby unusual opportunities are offered for various noxious creatures to multiply abnormally and harm the crop in different ways.

Diseases and Pests of Crops Among the various agencies which play their part in causing partial or total damage to growing crops we have representatives both from among animals and vegetable organisms. The losses caused to growing crops by various agencies have been estimated in different countries and it is found that a very good portion of the estimated out-turn in each case is shared by the various crop pests. According to Whetzel "the estimates of the plant disease survey of the U. S. A. Department of Agriculture indicate that approximately one bean in every dozen, one peach in every eight, one bushel of Irish potatoes in every twelve and one bushel of wheat in every ten are destroyed annually by disease in these crops." One can also have some general ideas of the whole-sale losses often caused to crops by such pests as locusts, swarming caterpillars and scale insects all over the world. The most noxious of all pests from the plant's point of view however is man. The enemies of growing crops are weeds of different kinds which either overgrow in the fields affecting the growing crops or are directly parasitic on them. There are also many small invisible micro-organisms like bacteria, fungi etc. which often levy their toll on the crops. Among animals we are all familiar with such higher forms like stray cattle and also wild animals like elephant, pigs, rodents, monkeys etc. in some out of the way areas. Among the lower animals the most important are insects and compared to most other agencies these play a very important and appreciable role as plant pests and the cultivator has to take special care against insects of various kinds some of which often completely destroy extensive areas of crops in an appreciably short period of time! An attempt is made in this very brief paper to offer a few hints to cultivators to help them to check insect pests of sorts which generally cause damage to growing crops with special reference to food crops, with which we are more concerned at the present time. Almost all growing crops and plants are found subject to the attentions of some insect or other and in some cases the different growing stages of individual crops have different categories of insect pests attacking them. It is therefore incumbent on the cultivator to be vigilant from the very early stages of the crop and nip in the bud any pest which appears on it.

Control Measures The different measures which can be adopted by man in the control of any pest, insect or any other organism, may be classed

into two groups - preventive or prophylactic and direct or curative ; the former consist of such measures which help to deter or keep away a pest from appearing and the latter include such methods which are employed to destroy or check the further multiplications of a pest when it has already made its appearance. The well known saying 'Prevention is better than cure' is a very old maxim and is specially appropriate in many cases where we have to deal with diseases and pests of various kinds ; but unfortunately the very sage advice contained in that pithy saying is more honoured in its breach than in its observance. It may be affirmed that in the case of many insect pests prophylactic measures will be found far more practicable and economical than those adopted to actually fight a disease or pest when it has made its appearance and when it often becomes too late to employ preventive measures, or too difficult to resort to curative methods. In certain special cases, none but preventive measures will be found practicable. It is only when we find it impossible or impracticable to adopt intelligent and prompt preventive measures that the need arises for resorting to what are called direct methods.

Preventive Measures The more important of the preventive measures which can be adopted against insect pests are the following :—

Field and Plant Sanitation Keeping the fields clean by removing all weeds is very important ; it not only helps the growing crop to grow without competition but it also helps in checking the multiplication of some crop pests which feed on these weeds. The removal of all crop remains after harvest such as stubbles of cereal crops, plant remains of such plants as sweet potato and cucurbitaceous creepers, brinjal plants etc. is also important since failure to remove these allows pests of such crops to breed unnoticed and appear on the same crops during the following season.

Cultural, Mechanical and Chemical Methods of Prevention Some of these measures though partially direct or curative go a great way in checking the multiplication of some pests and effecting their control easily and economically. These include deep ploughing to destroy weeds and white grubs attacking the roots of crops like chillies, cane etc., and for the destruction of the pupae of hairy caterpillars of sorts which are notorious pests this measure will be very useful. Apart from its purely agricultural effect scraping and cleaning field bunds will destroy eggs of grass hoppers especially in rice areas. Flooding of the fields when sufficient water is available will bring up underground pests like white grubs, cut worms, wire worms etc. which would otherwise emerge as adults to attack crops. Digging out and destruction of the nests of ants and white ants in and around any cultivated area will prevent these attacking growing crops especially white ants attacking crops like cane, wheat, groundnuts etc. Raking up and hoeing of the soil around cucurbitaceous plants and fruit trees will bring up the pupae of fruit flies which are bad pests of such crops and which get destroyed when brought to the surface by the weather or by birds etc. feeding on them. Treatment of setts of cane, grape vine etc.

with some chemicals like copper sulphate, crude oil emulsion, tar water etc. before planting prevents white ant, mealy bug and borer attacks during the early stages of the plant. Light Traps—Many insects including some well known crop pests are easily attracted to lights. The rice stem borer moth, the groundnut leaf miner moth, hairy caterpillar moths—of different kinds, cockchafer beetles of sorts, rice jassids and several important crop pests come to lights. A light trap may be kept at the very beginning of such crops so that the breeding of insects the adults of which get attracted to lights may be prevented. Any ordinary lantern kept hanging over a tray of kerosinated water will serve the purpose. Healthy seeds—The use of healthy seeds, cuttings, tubers, setts etc. for propagation will prevent the multiplication of some pests which remain hidden in the unhealthy seeds, tubers etc. and show themselves when the crop begins to grow. Growing of a trap crop—When an important insect is known to infest more crops than one the less important crop is grown as a trap to entrap the pest earlier to save the more important crop; this is of course not possible in all cases. The growing of pest resistant varieties of crops—Though this is an ideal, extremely desirable and a very easy method to prevent pests, we have not unfortunately advanced sufficiently well in evolving such pest resistant strains of crops which will stand the test uniformly. As a method for control of pests and diseases the use of resistant varieties of plants suffers from severe disadvantages even according to experts in genetics. A few of these are (1) Plants resistant to more than one disease are rare (2) There exist biological varieties or races of some disease or pest with different habits and so the resistance in one locality disappears in another due to such forms (3) Examples of absolute resistance are not only very few but even in such cases absolute resistance is found to be short lived. An equally encouraging method of pest control, with of course, numerous complexities as in the above method, is what is known as the Biological method of pest control—the use of natural enemies to control a pest. So until we reach better and surer results in these methods by further investigations and trials we have to resort to some of the ordinary practical measures noted above which will in many cases not only prevent the outbreaks of pests but in some considerably minimise the damage even if the pest appears. It is needless to add, however, that the success or otherwise of most of these measures depends a good deal on the promptness with which they are adopted and in the present emergency we cannot afford to resort to experimental measures.

Direct methods Coming to direct methods we could adopt mechanical, physical and chemical measures of different kinds suited to different categories of pests. More important among these methods include hand picking, netting, bagging, jarring, use of sticky boards, use of fly, moth and maggot traps, trenching and creating barriers preventing some pests which move from field to field in swarms. Many of these methods will be found extremely effective and economic if employed at the proper time. Many

insects like plant bugs, weevils, grasshoppers, flea and plant beetles, cockchafers, leaf hoppers etc. can be easily checked by handpicking, netting, jarring, bagging etc. which are simple contrivances and could be taken up by even the poorest ryot. Handpicking of hairy caterpillar moths, egg masses of borers, beetles, butterflies, moths etc. of plant caterpillars like those of citrus, castor and other crops will be found extremely effective and economic if resorted to in proper time.

Coming to the physical and chemical methods of insect pest control we all know that they have been in vogue in some form or other from time immemorial in various crude ways mostly as empirical and rule-of-thumb measures and it is only within the last century that scientific and rational use of such methods have come into vogue. Even these have their limitations. Some of those methods either physical or chemical might be very effective in killing a pest infesting a crop but the most important point to remember is that in killing the pest we must not also kill the crop thus making the remedy worse than the disease. Only such measures could therefore be adopted which, while killing or driving away the pest, should not in any way affect the healthy growth of the crop concerned. The artificial application of high and low temperatures which may be useful against some insect pests cannot be successfully adopted in the case of most growing crops. As regards the choice of suitable chemicals of different kinds, it depends a good deal on the nature of the damage done by a particular pest; generally those which remove and eat up the plant tissue are treated with insecticides known as stomach poisons which when they enter the stomach of the insect with the food material poison the creature and kill it; against those insects which suck up the juice of plants without removing the tissue, as in the former case, the materials used are known as contact insecticides which when they come into contact with the insect's body suffocate and kill it. There are numerous insecticides now in use belonging to each of these two main categories, for biting forms like grasshoppers, caterpillars, beetles etc. and sucking forms like plant lice, scales, plant bugs, mealybugs etc. Most of the stomach poisons now in use are unfortunately dangerous drugs (chiefly arsenic compounds) which are poisonous to both animals and man and as such their use can be safely carried out only by trained hands. In a country like India where the majority of the cultivators are illiterate, such remedies in their hands are likely to cause more harm than good. The recommendation of such dangerous and risky poisons, however effective in their own way as pest controls, is a matter which demands very serious and weighty considerations. Leaving aside that aspect of the question for the present we have first to examine and find out whether it will be advantageous to the average farmer of the Indian plains to adopt insecticidal measures of pest control against all his pests. Every one who has any correct ideas regarding agricultural conditions prevailing in India, especially regarding the comparatively small size of the Indian holdings, their proverbial poverty and the equally poor returns got out of

such staple food crops like rice, millets etc. can at once find out that insecticidal measures against pests on such field crops are quite impracticable and uneconomic. On the other hand, experience has shown that the use of insecticides to fight pests infesting valuable and well-paying crops like cotton, tobacco, sugarcane, fruit trees etc. are quite a practical and economic proposition. Nor is it a practical proposition in these days when such insecticides and appliances become non-available. Until therefore we are in a position to find out local preparations which are harmless to handle and which are easily available we have to be very careful in the use of poisonous insecticides. It will therefore be found that while modern methods of insecticide application might be suitable in the case of pests on paying industrial crops of different kinds the poor farmer growing food crops has to depend mainly on practical, cultural and mechanical methods. To put the whole subject briefly the safe guarding of the growing food crops needed for our modern emergencies from the ravages of insect pests depends a great deal on the proper attention and care bestowed on them by the cultivator all through the season and resorting to preventive and easily workable direct measures—unlike the absentee landlord who sows his seeds and returns to the fields only at harvest time. It has to be remembered that by our present efforts to raise crops in all available lands we are offering exceptional temptations to some of our worst pests to enable them to extend their nefarious activities to wider fields; as such greater attention has to be paid in the directions of the proper selection and preparation of the soil, sufficient manuring and irrigation and in preventing the attacks of diseases and pests.

In conclusion it has however to be strongly emphasised that in all measures of plant protection, especially in the case of small holdings, unless there is co-operation between farmers of adjacent plots—especially when we get mass attacks of pests like grasshoppers, cut worms, plant hoppers etc. in any area, the methods earnestly adopted by one or two individuals will not have any benefit. It need hardly be added that it is the important duty of the Government Agricultural Departments also to help the poor farmer in all ways to protect his growing crops so that he may get the expected returns for his labours.