UNIT-1

BIODYNAMIC AGRICULTURE

GOOD AGRICULTURAL PRACTICES IN CULTIVATION OF MEDICINAL PLANTS INCLUDING ORGANIC FARMING

INTRODUCTION

Good Agricultural and Collection Practices (GACP) for Medicinal Plants are a set of guidelines for farmers and collectors on how to produce high quality raw materials for the herbal medicine Industry. During the last few decades there has been an enormous growth in global demand for herbal products. This has presented growing numbers of people in rural areas with valuable opportunities to generate income from cultivation or collection of medicinal plants. The purpose of the GACP guidelines is to provide guidance to medicinal plant growers and collectors on how to meet the increasingly stringent demands of the herbal industry.

Good agricultural practices are set of principles applied through the food production cycle to produce safe healthy food taking into consideration economic, social and environmental sustainability.

- **GAPs are application practices that;**
- Improves safety and efficacy
- May be generic or specific to application method
- **Developed by registrants, growers, applicators and EPA**
- **Many already on labels**

- **Must document in fumigant management plan and/or post application summary to show compliance.**

Why GAPs is necessary?

- Ensure that all applicators follow the same standards.
- Reduce potential for;
  - Bystander and handler exposures to emissions from soil fumigants
  - Accidents
- Improve efficiency of soil fumigation.

Compulsory rules for the good agricultural practices

1. Conditions for application of fertilizer near water courses.
2. Crop Rotation.
3. Animal Density.
4. Capacity and constructions of manure storages.
5. Periods when the application of fertilizer is inappropriate.
6. Establishment of fertilization plans.
7. Rate and uniformity of spreading fertilizer and livestock manure.
8. Construction of shallow drug wells for drinking water.
9. Use of plant protection products.

Global principles of good agricultural practices

- ✓ Form 11 components of agricultural practices.
- ✓ Identify hazards to be avoided.
- ✓ Identify outcomes to be promoted.

-Provide a basis for the development of codes of practice for individual production systems.

General Principles of GAPs

The most important underlying principle of GACP is **Hygiene and Cleanliness**. Maintaining a hygienic production system is of critical importance at each and every stage of a medicinal plants journey, from the selection of seeds or planting material through to manufacturing the final product. The GACP guidelines provide a variety of specific instructions on how to maintain a hygienic production system, yet the main point to remember is:

Anything that the medicinal plant material comes into contact with must be SPOTLESSLY CLEAN

This includes hands, tools, containers, sacks, tarpaulins, washing tubs, drying racks, and so on. Anything that touches the medicinal plants or the medicinal plants are placed on should be thoroughly cleaned in advance. The reason is that these plants will be used to manufacture medicines; they are intended to improve people's health and it is therefore essential that they are not contaminated by bacteria or fungi. Bacteria and fungi (also known as microbes) are too small to see with the naked eye but exist in large quantities on dirty surfaces. If medicinal plant parts come into contact with these surfaces, they too will carry these microbes.

Another principle of GACP that is of critical importance is **Correct Identification**. Sometimes different medicinal plant species look very similar, or they share the same common name; the result is that the wrong species can find their way into herbal medicines, potentially causing serious health consequences to the consumer. Rather than identifying medicinal plant species by their local or common names, which can vary significantly from place to place, they should always be identified by their botanical name. This will ensure that everyone is speaking the same

‘language’ and there is no confusion during communication between farmers, collectors, processors and buyers.

The 11 components

1. Soil.
2. Water
3. Crop and fodder production
4. Crop protection
5. Animal feed and livestock production
6. Animal health
7. Animal welfare
8. Harvest and on-farm processing and storage
9. Energy and waste management
10. Human welfare, health and safety
11. Wildlife and landscape

GOOD AGRICULTURAL PRACTICES FOR MEDICINAL PLANTS

The large majority of traded medicinal plants are still collected from the wild. However, due to the growing demand for herbal medicines and the subsequent over-harvesting and depletion of medicinal plants in their natural habitat, more and more people are turning to cultivation to meet the requirements of the industry. Good Agricultural Practices (GAPs) for medicinal plants follow most of the same key principles as for other crops; the main difference is that medicinal plants

are grown to be used as medicines and the main objective is therefore to maximize the medicinal properties of the relevant plant parts and ensure that they are safe to use.

The main principles are:

1. Prevention of Contamination

During cultivation there are many different risks that can cause the plants to become contaminated. For example, if the soil or irrigation water is contaminated with pesticides and industrial waste this can easily be absorbed by the plant, or if the harvested plants are placed in dirty containers there are high chances that they will become contaminated. Many buyers now insist on testing the medicinal plant material and if traces of pesticide residue, heavy metals, or excessive levels of bacteria or fungi are found then the produce may be rejected.

2. Best Active Ingredients

Ultimately the medicinal plant material will be used to manufacture herbal medicines. This means that maximizing the medicinal properties of the relevant plant parts should always be a priority during cultivation. The location of the cultivation site, the variety of the species used, the irrigation cycles, the harvest time are some of the factors that may influence the potency of the active ingredients. These should all be researched and planned to ensure that the medicinal plant material contains the highest level of active ingredients possible.

3. Best Yield and Income

Good Agricultural Practices also explore how to optimize the yield of the crop, and therefore the income for the farmer. For example, the quality of the seed, the spacing between the plants and the rows, plant nutrition, weed management, insect pest and disease management, irrigation methods and the harvest stage and time all have a significant impact on the yield, as well as the

quality of the crop. The GAP guidelines explore the key principles that the farmer needs to follow at each stage of cultivation to optimize the yield and income from the crop.

4. Documentation and Traceability

One of the key themes of GACP is to be able to trace medicinal plant material back to its origin. If it is traceable then it becomes much easier to identify and therefore address any quality related issues that may arise at a later date. This is only possible if there is a documentation system in place to keep records at each stage of production. Record keeping is therefore a major focus of the GACP guidelines.

The DOs and DON'Ts in this section summarize the GAP guidelines related to medicinal plant cultivation, covering the main principles that should be followed to prevent contamination, optimize yield and the levels of active ingredients in the produce, as well as the records that need to be kept to ensure complete traceability of the final product.

A. SITE SELECTION

✓ **DO**

- Grow only those medicinal plants which are recommended for cultivation in that area
- Choose land that has access to a clean and reliable source of irrigation water
- Make sure there is sufficient space between your fields and other fields where pesticides are used to prevent any sprays from contaminating your crops

DO NOT

- Do not grow medicinal plants near potential sources of contamination such as industrial sites or busy roads

- Do not grow medicinal plants where there is a risk of contamination from pesticides being sprayed in neighboring fields

B. LAND PREPARATION

✓ **DO**

- Nourish the soil with plenty of organic matter
- Ensure that compost is well decomposed before use
- Prepare the land according to the specific needs of the medicinal plant species
- If possible, send a soil sample to a nearby laboratory for testing and plan any addition of plant nutrients accordingly

DO NOT

- Do not use compost made from city waste
- Do not apply fresh manure for plant nutrition
- Do not allow people to defecate in the plot where the medicinal plants are to be grown
- Do not use compost made from human excreta

C. SOWING/ PLANTING

✓ **DO**

- Use seeds that were harvested during the previous season
- Use seeds that are in good condition and free of pests
- Procure seeds or planting material from reliable sources
- Sow seeds or transplant seedlings at the correct time
- Where required, treat the seeds before sowing, preferably through organic means.

- Ensure correct spacing between plants and rows
- If you plan to plant other crops as an ‘intercrop’ then select compatible species which do not compete with main crop for inputs
- If you are collecting your own seeds label the seed packets with details of the species, the origin and date of harvest or collection

DO NOT

- Do not use seeds or planting material that are in poor condition or if you do not know where they came from and when they were harvested
- Do not use seeds or planting material if you do not know exactly which species and variety they belong to

D. IRRIGATION

✓ **DO**

- Apply a mulch to conserve soil moisture
- If possible, test the irrigation water for any contaminants and adopt appropriate measures to prevent contamination
- Irrigate medicinal plants according to the specific water requirements of the species- if in doubt, seek guidance from an expert and plan the irrigation schedule accordingly
- Use water from a clean source

DO NOT

- Do not irrigate the plants too little or too much

- Do not use water that may be contaminated by chemicals or waste materials
- Do not use any empty pesticide containers while irrigating the field

E. WEEDING

✓ **DO**

- Manage weeds before they start competing with the main crop for nutrients and light
- Use mulch to maintain moisture in the soil and to inhibit growth of weeds

DO NOT

- Do not use chemical herbicides to eradicate weeds
- Do not allow weeds to produce seeds -this will increase weed growth the following year
- Do not allow the soil to dry up due to excessive weeding

F. INSECT PESTS AND DISEASES

✓ **DO**

- Select medicinal plant species that are resistant to local insect pests and diseases
- Maximize resistance against insect pests and diseases through adjusting sowing time, appropriate seed treatment, balanced plant nutrition and timely irrigation
- Use organic practices such as use of companion crops, trap crops, light-traps, crop rotation etc.
- Identify and promote multiplication of predatory insects and birds

- Try to solve the problem with an organic pesticide, either made from locally available resources or buy a product from a reputed manufacturer or institution
- Use chemical pesticides only if there are no other options, and only if there is sufficient time between application and harvest to guarantee that the chemical cannot be detected in the medicinal plant material.
- If a chemical pesticide is used then ensure you use the correct dosage
- Seek guidance from an expert to plan and adopt integrated pest management practices on your farm.

DO NOT

- Do not grow medicinal plant species that are not adapted to the local environment and may be susceptible to the local pests
- Do not use chemical pesticides under any circumstances if your farm is certified organic

G. GAP DOCUMENTATION

✓ **DO**

- Keep a farmers diary with details of all on-farm activities. If you require help in keeping records, request assistance from your buyer.
- Use ‘harvest tags’ to record details of each harvest and the plant materials subsequent processing activities