

A Report

Study on major insects and diseases of Gerbera cut flower and their management in Nepal

July, 2018



Floriculture Association Nepal

Jwagal, Lalitpur, Nepal

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ABBREVIATION

DAP	Di-Ammonium Phosphate
FAN	Floriculture Association Nepal
FDC	Floriculture Development Centre
Fig.	Figure
i.e.	That is
K F	Kumar and Florist
M Sc Ag	Masters of Science in Agriculture
m ²	Square Meter
MAS ICM	Masters of Advanced Studies in Integrated Crop Management
MoP	Murate of Potash
o C	Degree Centigrade
U V	Ultra Violet

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Title:

Study on major insects and diseases of Gerbera cut flower and their management in Nepal.

1. GENERAL INFORMATION

1.2 Background Information

Nepal, the Himalayan country with lot of ecological diversity, is one of the world richest pockets in flora and fauna diversity. It is estimated that about 7,000 species of flowering plants existing in Nepal. So far, about 6,000 species of flowering plants and over 4,000 species of non-flowering plants have been enumerated from the country. About 5 percent of its flowering plants are endemic (Yanai, et.al, 2007). Economy of Nepal is primarily based on agriculture where floriculture sub-sector holds a great export potential. Floriculture is the discipline of horticulture, which refers to the cultivation of ornamental plants, flowering plants, foliage plants, cut flowers, bulbs, seeds and seedlings. Floriculture is fast emerging as a booming industry in the global context but it is relatively in a premature phase in Nepal (Gauchan, et.al, 2009). Flowers have aesthetic, traditional, cultural, and historic values along with the economic importance. Floriculture as a discipline of horticulture deals with the cultivation of flowering and ornamental plants for gardens and for floristry, comprising the floral industry. There are varieties of business related to floriculture; cut-flowers, foliages, indoor flowers, pot flowers, nurseries, and floristry accessories. The world flower economy is mainly dominated by the cut flowers. These cut flowers usually sold in bunches or in bouquets with cut foliages (FAN, 2016).

In the context of Nepal, floriculture is a newly emerging business. Traditional floriculture in Nepal is gradually turning to a modern lucrative business since early Nineties. Entrepreneur's enthusiasm and investment in this sector grew spontaneously with the encouragement received from the domestic as well as foreign markets (Baral, 2010). So far, Government of Nepal has not given enough focus for the promotion of this sub-sector so that import could be substituted and export could be promoted. Recently, Flower Promotion Policy is indorsed by the Government of Nepal and brought into the action. Only Floriculture Association of Nepal (FAN), a not for profit, non-governmental and national level professional business membership organization is working for the benefit of its members including flower growers/producers, wholesalers and retailers. Furthermore, Floriculture Development Centre, Godawari, Lalitpur is a governmental organization also working for the development of floriculture sector of Nepal.

The major cut flowers include Gladiolus, Rose, Carnation, Gerbera, Tuberose, Cymbidium Orchids (including Pleione, Praecox), Chrysanthemum, Aster, Lily, Anthurium, Bird of Paradise, etc in Nepal. The domestic production now fulfills more than 80 percent of the cut flower demands while rests are imported. FAN, 2016 reported the benefit cost ratio of gerbera cut flower cultivation is 1.40 followed by carnation (1.23) and gladiolus (1.09).

1.3 Introduction

Gerberas *Gerbera jamesonii* (Asteraceae) are perennial flower plants but are often treated as annuals. Flowers can bloom at any time of the year and are usually red, orange, yellow, or cream-colored and sit upon a thin stem (UC IPM, 2017). *Gerbera* (*Gerbera jamesonii*) is one of the important commercial cut flower in Nepalese flower market (Pun, 2004 and FAN, 2017). Day temperature of 22-25°C and night temperature of 12-16°C are ideal for the flower production and it requires shade house (50%) or naturally ventilated polyhouse. Well drained, rich, light, neutral or slightly alkaline soil with pH range of 5.5 - 7.0 is suitable for its production (TNAU, 2015). It has been accepted as an important competitive product for export in the international market too (FAN, 2007). According to the Floriculture Association Nepal, 2016 the daily demand of *Gerbera* cut flower is 5000-7000 stems in Nepali market. Whereas, the area covered by *Gerbera* cultivation is 120 Ropanis. Most of them are cultivated in protected conditions (Naturally ventilated plastic house, dome type plastic house, Bamboo pole plastic house). The crop management practice is the most important for the successful cultivation of *Gerbera* cut flower. Soil, climatic and management requirements, water and fertilizer as well as insect pest control are very specific for this cut flower.

White fly, thrips, mites, aphids, are common insects and powdery mildew, flower bud rot, fusarium, stem & root rots and wilt are common diseases of *gerbera* (TNAU, 2015 and Neupane, 2016). *Gerbera* cut flower production is challenged by numerous diseases affecting plant health and petal quality of cut flower. Powdery mildew, botrytis blight, alternaria leaf spot, root and crown rot diseases are important diseases of *gerbera* cut flower (Brisco and Hausbeck, 2018). Knowledge and skill regarding the identification and management of insects and diseases of flower crops are not well studied and not on-hand in Nepal. Thus, this study was held on March-July, 2018 and accomplished to fulfill the following objectives.

1.3 Objectives

- To assess the major insects and diseases of *gerbera* cut flowers in Nepal.
- To list the recommendation for the general management of major insects and diseases of *gerbera* cut flowers in Nepal.

1.4 Limitation of the Study

- This study only covers the summer and rainy season, (March-July) insects and pest of *gerbera* cut flower.
- Location of the study: Kathmandu, Lalitpur, Bhaktapur, Kavrepalanchok and Chitwan.

2. METHODOLOGY

Assessment of the major insects and diseases of gerbera cut flower was conducted by visiting the different types of growing conditions (Top vent, Dome and Bamboo poly-house) in 5 districts of Nepal namely; Kathmandu, Lalitpur, Bhaktapur, Kavrepalanchok and Chitwan. The commercial gerbera cut flower producing farms were selected with the consultation of FAN personnel (Annex 2).

The general list of the common insects and diseases of gerbera cut flower was collected by questionnaire (Annex 3) and review of literature. General morphological observation of insects and symptomatic diagnosis of diseases was performed in the field and the photographs of insects pests and their damage symptoms were taken and presented in the plates. The scoring of insects and diseases was done according to the severity responded by the growers in the photo-sheet game. The management measures were reviewed and recommendations were compiled in the tables.



3. RESULTS AND DISCUSSION

Based on the information collected from primary and secondary sources following results were found to be presented in this report.

3.1 Cultivation Status

3.1.1 Area and Demand of Gerbera cut flower

According to the FAN, 2017 the area under gerbera cultivation and demand of gerbera cut flower both are in increasing trend (Fig. 1 and 2).

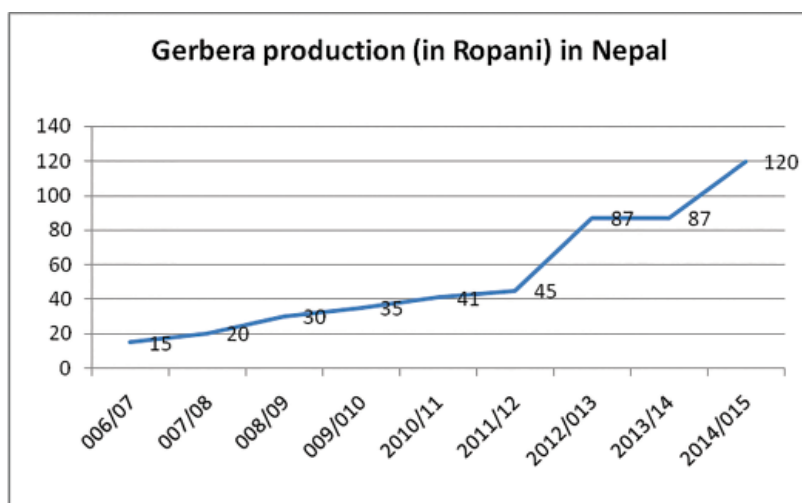


Fig 1. Area covered by Gerbera in Nepal

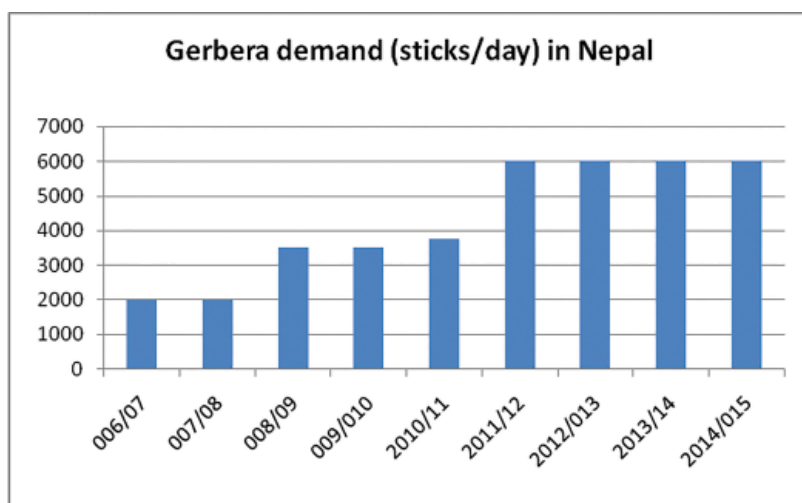


Fig 2. Demand of Gerbera cut flower in Nepal

The growers cultivated gerbera and other cut flowers such as carnation, chrysanthemum, gladiolus, rose, limonium, marigold, gypsophilla, statics etc. in their farms. Maximum 9 Ropanies and minimum 0.5 Ropani was the area under gerbera cut flower in the respondent farms (Fig. 3). Most of the flower farms are the members of Floriculture Association of Nepal (FAN). The growers had more than 15 years experience in the floriculture sector and considered as the major occupation for their livelihood and earnings.

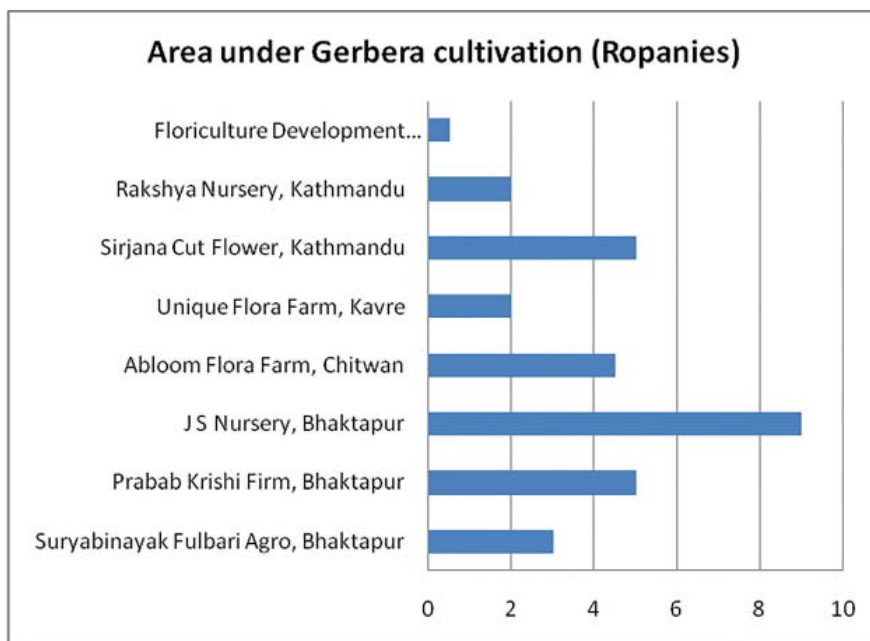


Fig 3. Area under Gerbera cultivation in surveyed farms

3.1.2 Source of Planting Material and Varieties

The growers imported the planting materials from India, Spain and The Netherland. K F Bioplants and Rise and Shine Biotech are two popular planting materials suppliers from India. Some growers used to propagate their selves by cutting. The common varieties of gerbera cut flower according to the color are presented in the table 1. The name of the varieties were depend on the companies of varietal development.

Table 1. Major varieties of gerbera cut flower according to the color

S N	Color	Varieties
1	Red	Alcaltraj, Zingaroo, Red Explosion, Ruby Red, Brunello
2	Pink	Bismark, Cerena, Rosalin, Picobela, Pink Eligence, Glamour
3	White	Paula, White Balance, Dalma, White House, Artist
4	Purple	Rubel,
5	Yellow	Amulet,
6	Orange	Candela, Dune

Source: Survey, 2018

3.1.3 Cultivation Practices

Well-drained soil having high organic matters is suitable for the gerbera cultivation. Gerberas require regular deep water and do best in rich, well-drained soil. They should be fertilized adequate regularly during the bloom period. Plants can do well in full sun, but in very hot climates, gerberas need partial shade.

The general plant population of gerbera cut flower is 4000-5000 plants per Ropani i.e. 500 m² (30-40 cm x 25-30 cm). The land preparation is done with the application of recommended manure and fertilizers such as farm yard manure or compost, Chemical fertilizers (DAP, MOP,) organic source of nitrogen, secondary and micronutrients (Calcium, Boron etc.). The raised beds prepared for planting seedlings. The cultivation structure for the gerbera cut flowers were bamboo poly-house and upgrading to dome without ventilation and top-vent structure. Silpaulin and UV stabilized plastic sheet both were found used in the cultivation structures. Some grower used thermal net in the plastic house. Most of the farms had drip irrigation system. Plant dis-budding is the major operations in quality cut flower production. Regular feeding to the plants and adoption of appropriate plant protection measures are important for the successful cut flower production.



Photo 1. Raised bed and drip irrigation system in gerbera cultivation

The manure and fertilizer application by the gerbera growers are as follows;

per ropani (500 m²) Basal fertilizers
Farm Yard Manure (FYM): 3 tip mini trucks
Poultry Manure: 35 sacks
Ash: 18 sacks
DAP: 9 Kg
MoP: 5 Kg
Ammonium Sulphate: 5 Kg
Regent (Insecticide): 1.5 Kg
Humic Acid: 5 Kg
Magnesium Sulphate: 5 Kg
Bio-zyme: 7 Kg
Zinc: 1.5 Kg
Borex: 1.5 Kg
Ferrus Sulphate: 1 Kg
Calcium Sulphate: 1 Kg
Magnesium Sulphate: 1 Kg
Besides, routine based application of plant nutrients from drip and spray.


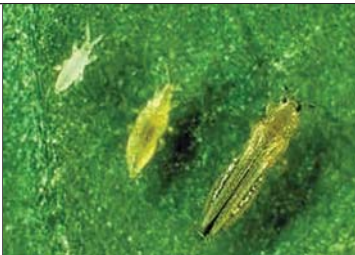


per ropani (500 m²)
Farm Yard Manure (FYM): 3 tip mini trucks
Ash: 1/2 tip mini trucks
DAP: 10 Kg
MoP: 7.5 Kg
Borex: 1 Kg
Magnesium Sulphate: 1 Kg
NPK Spray 5 gm/lit./week,
Micronutrients (Multiplex) spray


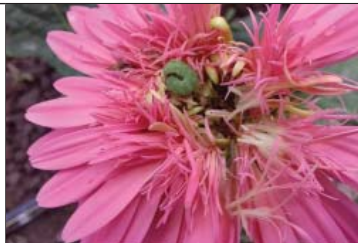


3. 4. Insects and Diseases

The major insects and diseases observed during the farm visit and mentioned by respondents were listed in the below table 2 and 3 according to the severity of the damage.

Table 2. Major insects of Gerbera

S N	Name	Symptoms	Time of severe attack	Management measures adopted
1	White Fly (<i>Bemisia spp.</i>)		Summer	Pesticides applied: Use of yellow sticky trap, Spray of insecticides: Acetamiprid, KINGSTAR, OBERON, OLALA, Pegasus
White fly is an important sucking pest of gerbera, especially in green house condition. This pest also transmits the viral diseases into the plants.				
2	Thrips (<i>Thrips tabaci</i>)		Dry summer months	Pesticides applied: Emamectin Benzoate (KINGSTAR), Dimethoate (ROGER), Imidachloroprid, Oberon
Puncture leaves and flower to suck cell sap. Thrips feeding causes stippling, color break and papery leaves, and leave speck-like black feces where they feed. Heavy infestation of this pest causes the flowers to the distorted shaped flower.				
3	Leaf Miner (<i>Liriomyza spp.</i>)		All round the year	Pesticides applied: Dimethoate (ROGER), Imidachloroprid, Carfaf Hydrochloride crimazime, Pegasus
Leaf miner is a serious pest of gerbera. larvae borne inside the leaves and make irregular serpentine tunnels feeding mesophyll.				
4. Aphids infest young leaves and buds and causes injury by sucking the sap which results in distortion of tissues.				
4	Aphids (<i>Myzus persicae</i>)		All round the year	Pesticides applied: Dimethoate (ROGER), Imidachloroprid, Chloropyriphus + cypermenthrin

5	Mites (<i>Tetranychus urticae</i>)		Summer months (Chitra-Shrawan)	Pesticides applied: Cyromizine (KINGHUNTER), Proparizite (OMITE), Dimethoate (ROGER), Abamectin, OBERON, Metable sulphur, Pegasus
	The development of leaves and flower buds were adversely affected and the flowers were malformed and unsalable.			
6	Borer (<i>Spodoptera spp.</i>)		All round the year	Pesticides applied: Emamectin Benzoate (KINGSTAR), Abamectin NEEMRAJ, DADAGAURD, Fem
	The larvae stage (caterpillar or borer) of the moth feed the floral part of the plant and flowers distorted and unsalable.			
Besides, above mentioned insects pests cut worms in soil, slugs are also damage the gerbera cultivation.				

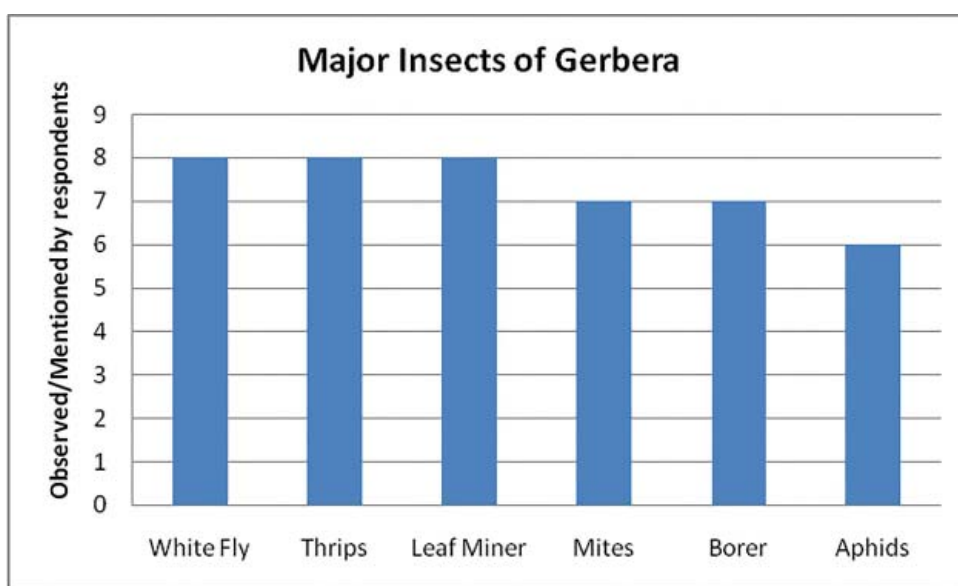






Fig 4. Major Insects of Gerbera

Table 3. Major diseases of Gerbera

S N	Name	Symptom	Time of severe attack	Management measures adopted
1	Rots (root/foot, crown/stem) 		All round the year, mostly during hot and humid period	Fungicides applied: Carbendazim, Mancozeb, Copperoxychloride, Metalaxyl, fosityal al benomyl etc.
<p>Root Rot (<i>Pythium spp.</i>): Plants wilt and die as roots rot.</p> <p>Crown Rot (<i>Phytophthora spp.</i>, <i>Rhizoctonia spp.</i>): Plants wilt, leaves brown, crown rot develops. Besides, Stems at the soil level have a brown lesion. Plants wilt and die.</p> <p>Stem Rot (<i>Fusarium spp.</i>): Petiole of leaves blacken at the base as the plant collapses.</p> <p>Management: Plant healthy planting material in sterilized potting media/treated soil media. Avoid overhead watering. Apply a fungicide to protect plants.</p>				
2	Powdery Mildew <i>Golovinomyces cichoracearum</i> (formerly <i>Erysiphe</i>)		Rainy season (hot and humid period)	Thiophehate Methyal, Dinocap (KARATHANE), Sulphur, Nativo Keroxim Mithyal
<p>White fungal growth develops on the surface of leaves.</p> <p>Management: Prune and destroy diseased leaves and plant.</p>				
3	Leaf Spot (<i>Alternaria</i>)		all round the year	Fungicides applied: Hexaconazole
<p>Brown specks form on florets and the leaves. Centers become white on the leaf spots.</p> <p>Management: Maintain low relative humidity and do not wet leaves when watering. Apply a fungicide to protect plants.</p>				

4	Floral Blight <i>Botrytis cinera</i>	Petioles have long brown spots. Leaves yellow and die. Petals have tan spots. Stems at soil level are killed. Infected tissues become covered with gray fungal growth.	Mostly during low night temperature and hot during day time.	Space plants to insure good air circulation. Maintain low humidity. Avoid watering late in the day. Remove crop debris. Apply a fungicide to protect plants, Copper oxichloride
5	Bacterial leaf spot and blight	Small to large spots are circular at first, then become irregular and dark brown to black. Later, it will spread in whole leaf and blight symptoms appear.	Die back of branches after removal of flower stick	Maintain low relative humidity. Avoid overhead watering.

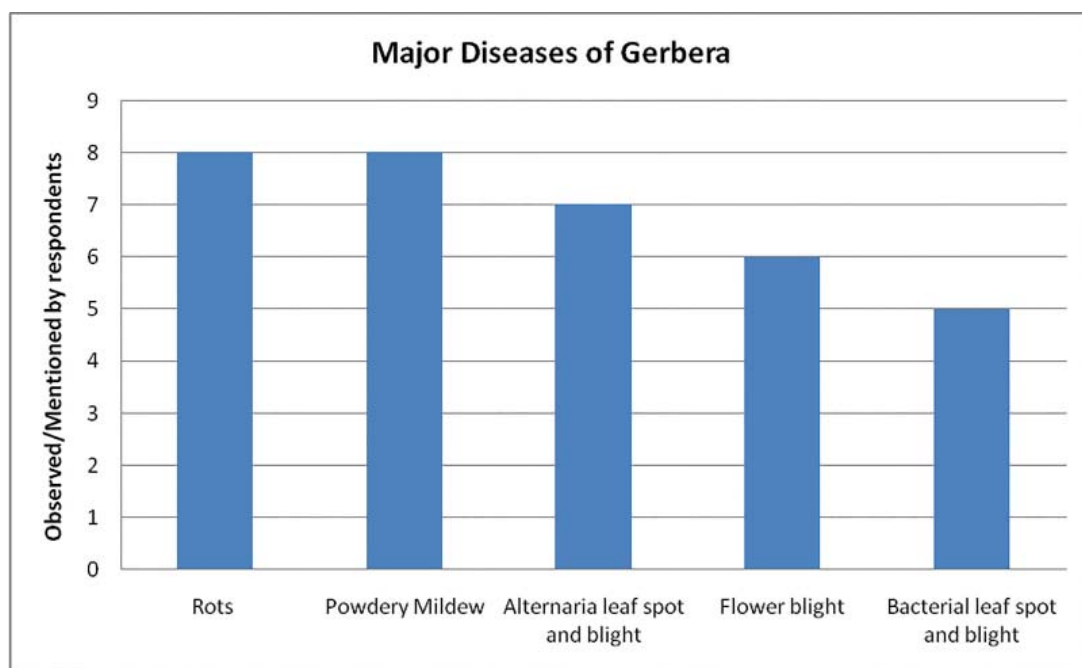


Fig 5. Major Diseases of Gerbera

3.5 Nutritional Disorders in Gerbera



Figure 1. Control (left) and nitrogen deficiency (right).



Figure 2. Phosphorus (left) and potassium (right) deficiency.



Figure 3. Calcium (left) and magnesium (right) deficiency.

Jeong, K.Y., B. Whipker, I. McCall, C. Gunter, and J. Frantz. 2009. Characterization of nutrient disorders of gerbera hybrid 'Festival Light Eye Pink'. *Acta Hort.* 843:177-182.



Figure 4. Control (left) and sulfur deficiency (right).



Figure 5. Boron toxicity.



Figure 6. Copper (left) and zinc (right) deficiency.



Figure 7. Iron deficiency.

(Source: Jeong et al., 2009)



(Source: Andro, 2016)

4. CONCLUSION AND RECOMMENDATION

Gerbera is one of the important cut flower in Nepalese flower market. The demand and production of gerbera cut flower is increasing year by year. Flower growers of Kathmandu valley and vicinity district are producing gerbera cut flower. Most of the cultivation is under protected condition i.e. plastic house. The insect, diseases and nutritional problems are also the factors that reduced the yield and quality of cut flowers. White fly, thrips, mites, aphids, borer and leaf miner are major insects; and rots, powdery mildew, alternaria leaf spot, flower blight and bacterial leaf spot were observed as the major diseases during the study period. Growers were mostly used the chemical measures for pest management. Disease management strategies vary depending on the production system involved and can include cultural, biological and chemical measures as well as the use of resistant varieties.

Recommendations:

- Year round surveillance of insect and diseases of gerbera cut flower should be conducted to know the time of incidence of the problems.
- The appropriate management measures should be generated to recommend gerbera cut flower growers for management.

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Annex 1: Photo sheets

INSECTS DAMAGE



Borer in flower



Funnel trap



Leaf Miner and Mites damage



Thrips damage in flower and Leaf defoliating insect's damage in leaves

DISEASES



Powdery Mildew



Alternaria leaf spot



Leaf blight



Leaf edge burning



Leaf edge curving and burning



Wilting



Rots (Root/Foot, Crown/Stem)



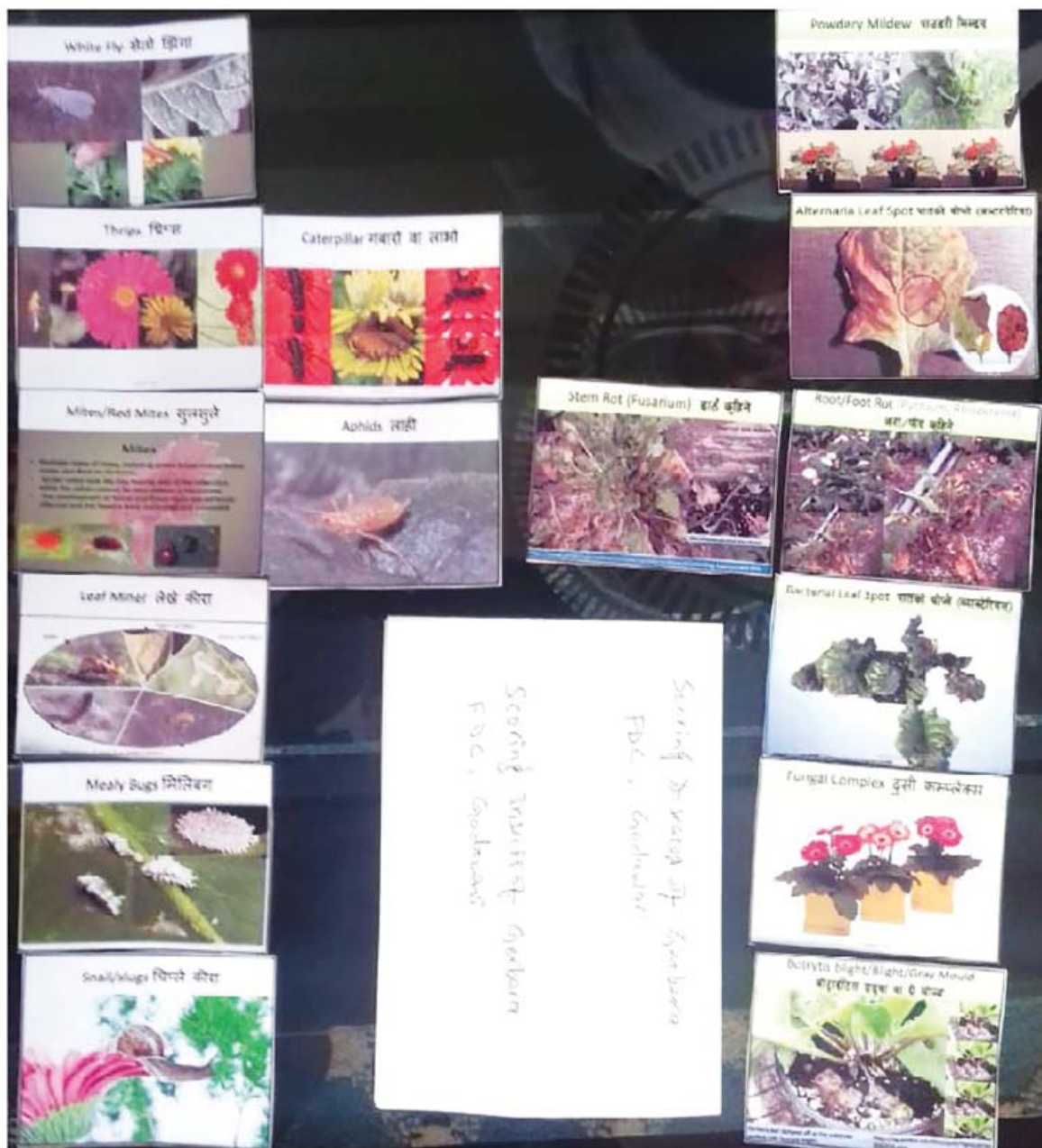
PHOTO SHEETS - Field visit





Scoring the severity of insect pests and diseases







Annex. 2: Respondents detail

List of Gerbera farms:

S N	Name of the organization/farm	Address	Responsible/Respondent personnel	Cultivation structure	Area under Carnation cultivation (Ropanies)
1	Suryabinayak Fulbari Agro, Bhaktapur	Suryabinayak-1, Bhaktapur	Decent Baidya, 9801108704	Naturally Ventilated plastic house	3
2	Prabab Krishi Firm, Bhaktapur	Katunje - 5, Bhaktapur	Prajwal Chaguthi, 9801113173	Naturally Ventilated plastic house	5
3	J S Nursery, Bhaktapur	Suryabinayak-4, Bhaktapur	Jaya Bahadur Khadka, 9860073763 Son: Sushil Khadka, 9851134898	Naturally Ventilated plastic house	9
4	Abloom Flora Farm, Chitwan	Bharatpur-19, Chitwan	Prakash Pant, 9855057207	Naturally Ventilated plastic house	4.5
5	Unique Flora Farm, Kavre	Banepa-10, Janagal, Kavre	Bhojraj Timalisina 9841488131	Naturally Ventilated plastic house	2
6	Sirjana Cut Flower, Kathmandu	Nagarjun-8, Ghattekhola, kathmandu	Pandav Shrestha, 9851163261	Naturally Ventilated plastic house	5
7	Rakshya Nursery, Kathmandu	Shankarapur, Gagalfedi, Kathmandu	Min Bahadur Tamang, 9851093822	Naturally Ventilated plastic house	2
8	Floriculture Development Center, Lalitpur	Godawari, Lalitpur	Drona Raj Kafle, 9851204260, 9841609524, Tara Chandra Chaudhari, 9847069534 and Sirjana Poudel, 98	Naturally Ventilated plastic house	5

Annex. 3: Questionnaire for assessment of insects and diseases of Gerbera cut flower in Nepal

Date:

1. Grower's General Information

1.1 Name of Grower/Respondent:

1.2 Name of the farm:

1.3 Farm Address:

1.4 Contact No.:

1.5 Age/Sex:

1.6 Ethnicity:

1.7 Family size:

Male:

Female:

1.8 Main occupation:

1.9 Affiliation to Any Co-operatives/Farmers group:

1.10 Relevant training if attended regarding flower cultivation:

2. Cultivation status:

2.1 Since when you have started flower business?

2.2 Area of flower cultivation?

2.3 What are the major flowers grown in your farm?

S N	Crop	Area	S N	Crop	Area

3. Gerbera:

3.1 Major varieties grown in the farm:

3.2 Planting material from? (Name of the countries)

3.3 Area under gerbera/Number of plants:

3.4 Month/Time of planting

3.5 Month/Time of harvesting

3.6 Cultivation practices:

3.6.1 Planting distance (plant population)

3.6.2 Manure and fertilizer

Name, amount/dose and time of application

3.6.3 Cultural operations:

3.7 Cultivation structure: Top vent / Dom without ventilation / Bamboo poly-house

3.8 Quality of plastic: Silpauline /UV stabilized

3.9 Irrigation system: Furrow/Drip/Sprinkler 4. Major insects and diseases:

4. Major insects and diseases:

4.1 Major insects: (according to the severity of damage) and management measures applied

S N	Name	Time of severe attack	Symptom	Management measures adopted	Remarks (mentioned/ observed)

4. Major insects and diseases:

4.2 Major diseases: (according to the severity of damage) and management measures applied

S N	Name	Time of severe attack	Symptom	Management measures adopted	Remarks (mentioned/observed)

5. Other problems:

6. Harvesting, post-harvest and marketing aspects:

6.1 Harvesting stage

6.2 Post-harvest management

6.2.1 Packaging

6.2.2 Storage

6.3 Market

6.4 Average price

At last,

“THANK YOU FOR YOUR TIME AND CO-OPERATION”





Floriculture Association Nepal

Jwagal, Lalitpur, Nepal