RAMA UNIVERSITY

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FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

RHUBARB

BOTANICALNAME: *Rheumrhaponticum*
FAMILY: Polygonaceae
ORIGIN : Temperate Asia, probably Siberia

AREA AND PRODUCTION

- Rhubarb is a native of the cooler areas of Asia, probably Siberia but it is grown in Europe and England for its large, thick leafstalks or petioles which are used for sauces.
- Most commonly, the plant's stalks are cooked and used in pies and other foods for their tart flavour.
- It is used in the diet in place of fruits.
- It was introduced into Europe in 1608 and was first grown in Italy.
- The first mention of its use in America was in 1778, but by 1806 it was in common use.

NUTRITIVE VALUE (per 100 gram of edible portion)

CHO (g)	3.80	Vitamin A (IU)	100
Ca (mg)	130	Moisture (%)	93.30
Vitamin B_2 (mg)	0.04	P (mg)	21
Protein (g)	0.74	Fibre (g)	0.75
Fat (g)	0.13	k (mg)	360
Niacin (mg)	0.3	Mg(mg)	21
Na(mg)	6	Ash(g)	1.10

CLIMATE

- The vegetative parts of the plant are killed at temperature less than 3°C.
- The rhubarb crowns and rhizomes are resistant to cold and dry conditions.
- The plant thrives in the regions where the crowns remains frozen all winters and where the soil remains dry throughout the summers.
- The plant requires temperatures below 10°C to break dormancy.
- At relatively low temperatures, for growth, the stalks develop the pink

colour, while at high temperatures the green colour predominates.

- Rhubarb does not grow well in regions, where the mean temperature during summer is 24^{o}C, or the winter mean temperature is much above 4.4^{o}

VARIETIES

- Rhubarb can be grown as an outdoor plant and as a forcing plant.
- Cultivars of rhubarb may also be chosen according to the color of theirpetioles.
- For outdoor production, the cultivar Mac Donald, Sunrise and Ruby have large red stalks.
- They are vigorous and upright growing.
- Valentine is another red stalked cultivar that is popular for growing in home gardens.
- For forcing, Timperley, Early Victoria, Crimson Red and Sutton are used.
- Victoria a green stalked cultivar,a heavy yielder and excellent for commercial purposes.
- Sutton is a pink- stalked cultivar.

PLANTING

- Rhubarb is usually propagated by dividing the crowns formed during the previous season.
- Crowns are divided in late fall or early spring.
- Plants must be divided and reset every 4 years to keep the bed in vigorous condition.
- Plants not divided may become large and stalks may become more numerous than desired.
- Seed stalks should be removed as they appear.
- Seed propagation is used in the development of new varieties
- The crowns are planted during the spring where the freezing temperatures are common.
- The crowns are planted in autumn where the temperature is not freezing.
- Good drainage is essential for growing rhubarb.

SPACING

- Row to row : 120-180 cm
- Plant to Plant : 60-120 cm
- Commonly used spacing for commercial rhubarb planting in rows 120 cm apart with plants 120 cm apart in row.
- Trenches are dug prior to planting, generally 15 cm deep.
- Crown pieces are placed 5 cm below the surface of the soil in the trench. Soil is pulled over the soil and firmed.

NUTRIENT MANAGEMENT

- Rhubarb grows best in soils with a pH range of 6 to 6.8.
- The crop has a high demand for calcium and magnesium.
- Rhubarb is a heavy feeder, therefore will perform best on sandy loam to loam soil with a good organic matter level and better drainage
- To achieve early field production, plantings need to be made on light soils with a southerly exposure.
- Well rotten Farm Yard Manure @ 500q/ha should be applied before ploughing specially in the soil with low organic matter.
- A green manure crop is desirable to be incorporated one year before planting Rhubarb.
- About 100-150Kg each of N, P and K should also be applied for good results.
- The nitrogen should be applied in the form of 2-3 applications with the first application at bud break stage.
- Try to avoid putting nitrogen fertilizer too close to the roots as it can burn the small feeder roots.
- Phosphorus is not very mobile, so select a planting site that is high in phosphorus.
- If additional phosphorus is required it can be broadcasted with nitrogen and potassium early in the spring and mixed into the soil with a light cultivation between the rows.

Lime:

- It should be applied to maintain the soil pH in the range 6.0 to 6.8 (rhubarb will tolerate soil acidity as low as 5.0 but yields and fertilizer efficiency will suffer).

Micronutrients:

- Boron may be necessary for the health of buds and roots. Apply 1 to 2 kg Borax per hectare as soil application.

USE OF GROWTH REGULATORS

- Gibberellic acid is useful in rhubarb forcing to break dormancy and to permit early production and to increase yields.

IRRIGATION

- The rhubarb plant responds well to moisture, although reliable yields can be obtained with minimal watering.
- Irrigation prior to harvesting is necessary to increase crop yield
- Delay irrigation after harvest until plant injuries have healed.

WEED MANAGEMENT

- Various types of mulch may be used between the plants and in the rows (most commonly straw).
- Weeds can be controlled by frequent shallow cultivation before sprouting.
- Grass weeds can be controlled with glyphosate or round-up@ 2-3kg a.i./ha, or with Gramoxone or Paraquat @2.25-3.75 l/ha.

1. MULCHING

- Straw may be applied in late fall or during the winter as a mulch to keep down weeds and ensure a cleaner harvest environment from soil.

CULTURE AND CARE

First Growing Season:

- Plant only in fields that are as clean as possible from perennial weeds.
- Cultivation should be shallow throughout the growing season.
- Hand hoeing should be preferred and contact herbicides like Gramoxone may be sprayed between the rows with the crop shielded.
- Flower stalks should be cut off as soon as they appear.
- One or two side dressings of nitrogen may be necessary.
- No crop should be harvested during the first season.
- In the fall, well rotted manure and/or straw should be applied to the soil surface.

Following years:

- Cultivate occasionally to keep weeds in check but be careful not to cultivate too deep or close to the crown and fleshy roots.

HARVESTING

- Harvesting is not done during first year of growth.
- Leaves of field-grown plants are usually serially harvested, a few at a time over a number of weeks with new growth replacing those from base of crown.
- Petioles are not removed by cutting to avoid the virus spread.
- Red varieties tend to yield about half that of the green varieties.
- Field yields can vary depending on the age and vigour of the stand and can range between 150-400q/ha in a single cutting harvest season.
- Harvest begins in late May or early June depending on location and can last for 8 to 10 weeks. Rhubarb is harvested by hand.
- The stalks are pulled rather than cut.
- The leaves are removed in the field and only the stalks are marketed.
- Harvesting in the same year following planting is possible but has been found to reduce productivity in the long run.
- Second year harvests are preferred.
- A healthy stand should remain productive for 5-10 years.

GRADING, PACKING AND STORAGE

- The harvested stalks are washed and tied in bundles of 0.5kg or more and they are packed in boxes lined with paper for shipping.
- Grading should be done according to the length of stalk, colour and quality.
- It can be graded as I and II grade.

STORAGE

- Harvested stalks remain in good condition for about 4 weeks when stored at 1 to 2^{o}C and 92% Relative Humidity.
- The storage life can further be extended by wrapping in moisture proof film and

storing at 0°C and 90% Relative Humidity.

- Hot water treatment for 2 minutes at 52°C doubles shelf life at 21°C.

FORCING

- Production of rhubarb stalks during the winter is called “forcing of rhubarb” in regions where the climate is suitable for production of vigorous crowns.
- The roots of three-year-old plants dug out late in the fall are left outside for two weeks till they are frozen thoroughly to allow the buds to be in rest period.
- A thin layer of soil is spread to prevent evaporation of moisture.
- These frozen roots are then replanted in the field.
- These frozen roots are then taken in to hot beds in specially constructed forcing structure or in any dark or semi dark locations where moderate temperatures can be maintained.
- Windows should be covered to exclude light.
- Now the buds are allowed to sprout. Under dark/semi dark conditions, the stems develop a rich pink or red colour and good quality.
- The optimum temperature for proper development of stalks is 15.6°C and the growth is very poor at 10°C.
- The crowns are placed on the floor of the forcing structure as close as practicable and covered with 5-7.5 cm of soil.
- By the high temperature, the crowns will sprout and stalks grow out.
- After reaching a length of 45 cm, they can be harvested, packed and sent to market.

DISEASES & PESTS

Leaf Spots : (Ramularia and Ascochyta spp)

- These fungi cause circular or angular spots, variable in size having big centers surrounded by a red zone.
- When affected tissue dies, it may drop out, leaving large ragged holes in the foliage.
- These fungi overwinter in infected plant debris and propagation stock.

Control measures

- Remove and destroy leaves following the first heavy frost.
- During harvest, remove stems with spotted leaves first.

Botrytis rot : (Botryis cinerea)

- The fungus may cause a leaf, stem and crown rot of forced rhubarb.
- Disease intensifies where there is poor air circulation and high humidity.

Control measures

- Follow strict sanitation.
- Apply recommended fungicides like copper oxychloride @ 0.3per cent at first appearance of disease and repeat at 7 days interval.

Root and crown rots: (Pythium and Phytophthora spp)

- Plants become unthrifty.
- Leaves may turn yellow to red and collapse.

- The crowns, when sectioned, exhibit a brown-black decay.
- Large roots lack small feeder roots.
- Larger roots may have large brown-black lesions.

Control measures

- Purchase healthy propagation stock.
- Select well drained fields.
- Remove and destroy the diseased plants.

VIRAL DISEASES

- Several viruses are known to occur in rhubarb but turnip mosaic, arabis mosaic and cherry leaf roll virus are the most common.
- These viruses have wide host range and cause mottling and ring spotting of leaves.
- They may be introduced through infected planting stock.

Control measures

- Obtain and plant healthy nursery stock.
- Avoid planting virus free crowns near virus contaminated crowns.

PESTS

Potato stem borer: (Hydraecia micacea)

- The first stage of the insect attacks only weeds and couch grass in particular.
- Later they move into plants with thicker stems, such as rhubarb.
- They may move from stem to stem, boring into the centre of the stalk.
- The adult moths lay their eggs on the stems of grasses in August.
- The eggs do not hatch until the following spring.
- Damage can be expected in June and early July.
- Serious infestation can lead to an unmarketable crop.

Control measures

- This pest is not a serious problem when couch grass and other weeds are controlled in and around the rhubarb plantation.
- Weeds should be controlled to make the field less attractive for egg laying by the adult moth.
- In early spring burning of affected fields or field margins will effectively control this pest.

Tarnished plant bug: (Lygus lineolaris)

- Adults are very active and quick moving.
- They damage rhubarb by piercing their mouth parts in leaves and stalks thus causing wilting and distortion of leaves.
- This bug is a pest of new plantings.

Control measures

- Keep plantings and adjacent areas weed free.
- Avoid planting adjacent to legumes.
- If attack is severe, apply dimethoate (0.03 %) or oxy-demeton methyl (0.025 %).

Slugs

- Slugs may be a problem in plantings with heavy soils, poor drainage and in weedy situations.
- Slugs feed at night by rasping the surface of stems, leaving unsightly scars,

which reduce the salability of the stem.

Control measures

- Provide good soil drainage.
- Keep weeds under control.
- Remove leaves and trash from the field when harvesting.
- Do not use manure and/or mulches in areas of field prone to slug damage.

Black bean aphid: (Aphis fabae)

- Heavy population of this pest causes curling or wilting of leaves.
- There is also potential for the spread of virus by this aphid.

Control measures

- Spray malathion (0.05%) or oxy-demeton methyl (0.025 %).

Flea Beetle:

- These can cause damage to new plantings by their feeding activity on the leaves.
- They are especially active during hot dry weather.

Control measures

- Remove weed hosts, follow the phytosanitary measures and spray carbaryl (0.1%).
- Repeat spray if attack persists.