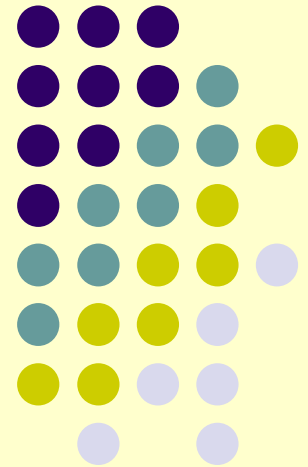
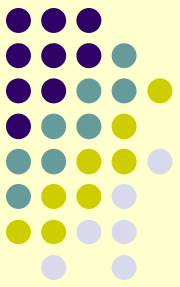


Production Technology of Under Utilized Fruits: Kair {*Capparis decidua*} and Cordia {*Cordia dichotoma*}

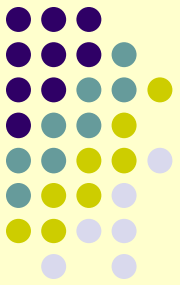
P.K. Yadav
Assistant Professor
College of Agriculture
Bikaner-334 006



Importance of under-utilized fruits



- **Nutritive:** Fruits e.g. Aonla, bael, jamun, timru, datepalm, khejri
- **Processing:** Jam, Jelly, Syrup, squash, Candy, Toffee,
- **Sugar :** Datepalm
- **Gums:** Used in textiles, cosmetics, cigars, paste & ice cream industry bael and chirongi
- **Oils and fat:** Oil used in soaps, paints, varnish, hair oil pharmaceutical basis and lubricant (Mahuca seed contain 51 % oil)
- **Essential oil:** flower buds of caparis spinosa contain essential oils.
- **Spices and Condiments:** Tamarind, anardana used for this purpose.
- **Medicinal :** Bael, Aonla, Jamun, etc fruits used to cure of heart, jaundice, diarrhea and eye disorder



Medicinal importance of some underutilized fruits

Bael : Used in chronic diarrhoea and dysentery

Turang : Appetite, digestion and problem of stones

Aonla : Diabetes, heart, respiratory disorder, dysentery, jaundice

Ber : asthma and liver complaints, root decoction in fever

Jamun : stomach disorder, diabetes, piles ,diarrhoea and dysentery

Morus : Green fruit, useful in stomach ailments good for curing the mental disease, hysteria and constipation.

Drum stick : Used in purification of water and softening of hard water.

Lasoda : Anthelmintic diuretic

Salvidora(pilu) :Leaves used against the cough rheumatism & low fever

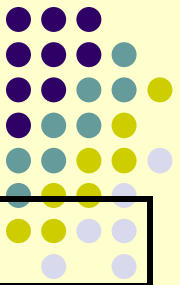
Khejri : it control cough ,asthma, leprosy, tuberculosis, bleeding piles

Karonda ; seed powder is used in curing of cracking skin of foot and hand

Kair : good for analgesic, diaphoretic, laxative,anthelmintic, cough, asthma

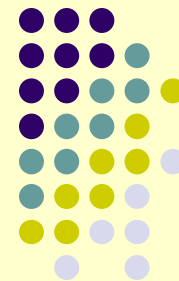
Khirini : it gives strength to heart and used in tuberculosis and leprosy

Distribution of area under duns soils and sandy plain soils (mha) in Rajasthan



District	Dun soils	Sandy plain soils
Jaisalmer	1.69	1.16
Bikaner	1.29	1.03
Barmer	1.00	1.31
Churu	0.89	0.52
Jodhpur	0.29	1.32
Jalore	0.24	0.26
Sri Ganganagar	0.20	1.25
Nagaur	0.12	0.64
Jhunjhunu	0.06	0.38
Sikar	0.04	0.49
Ajmer	0.007	0.04
Pali	0.005	0.06
Jaipur	-	0.31
Alwar	-	0.02
Total	5.85	8.83

IMPORTANCE OF CORDIA PLANT



Fruits: UNRIPE MATUTE FRUITS USED IN PICKLE & VEGETABLE,
RIPE FRUITS ARE RICH IN VITAMINS AND MINERALS

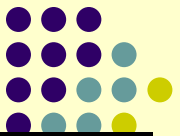
Fodder: LEAVES USED AS FOODER FOR GOAT CONTAINS
ABOUT 12-16 CRUDE PROTEIN AND 16-27% CRUDE
FIBRE

Medicinal: FRUITS CONSIDERED AS ANTHELMINTIC, ANTI
TUMER,
DIURETIC, DEMULCENT AND EXPECTORANT

Wood: TO MAKE THE ORNAMENTAL FURNITURE AND TOYS

Wind break : IN ARID REGIONS IT PROTECT THE ORCHARD
FROM HOT
WIND & GIVE THE ADDITIONAL INCOME TO GROWER

Nutritive value of *cordia* fruits

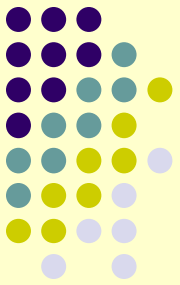


Constituents	Value Per 100 g pulp)
Water	82.5 %
Protein	1.8 %
Fat	1.0 %
Minerals	2.2 %
Fiber	0.3 %
Carbohydrate	12.2 %
Acid	0.2 %
Pectin	4.51 %
Total soluble solids	10.2 %
Ash	2.13 %
Energy	65 Kcal
Calcium	40 mg
Phosphorus	60 mg
Potash	1.66 %
Iron	0.0055 %

CLIMATE & SOIL REQUIREMENT FOR CORDIA

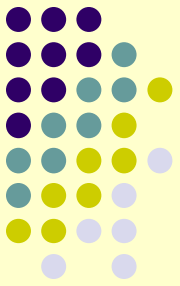
- **THRIVES WELL IN TROPICAL AND SUBTROPICAL CLIMATE**
- **SUSSEPETIBLE TO FROST BUT TOLERATE 1⁰C TEMP FOR FEW WEEKS.**
- **WITHSTAND DROUGHT TO A VERY EXTENT**
- **TOLERATE HIGH TEMP. UP TO 45-48 ⁰C during summer .**
- **Crop can successful grown in area having rainfall 250-300mm or more**

SOIL REQUIREMENT FOR CROP



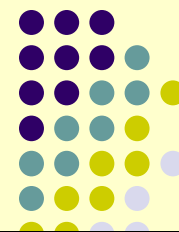
- **SUCCESSFUL GROWN IN NEGLECTED LAND, WASTE LAND, LOW FERTILITY, SANDY SWAMPY SALINE ALKALINE**
- **SANDY LOAM SOILS MOST SUITABLE FOR VIGOROUS GROWTH & PRODUCTIVITY, BUT KAIR CAN BE SEEN ON ROCKY & GRAVEL SOILS**
- **SALINITY TOLERANT UP TO SOME LEVEL**
- **pH 9.0**
- **Kair grows successfully in sandy soils when other most of the crops fail to grow**

Propagation: EFFECT OF DIFFEREN TREATMENT ON SEED GERMINATION OF CORDIA



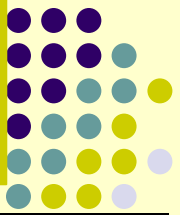
TREATMENT	SEED GERMINATION %
CONTROL	25.3
SOAKING IN HOT WATER	30.7
SOAKING IN FRESH WATER 2 DAYS	33.7
“ “ “ 4 DAYS	38.7
“ “ “ 6 DAYS	37.3
H ₂ SO ₄ TREATMENT FOR 20 MINUTES	29.3
“ “ “ 25 “	37.3
“ “ “ 30 “	38.7
HAND CRACKING	25.3

SUCCESES OF GRAFTAGE DUE TO DIFFERENT METHODS & MONTHS IN CORDIA



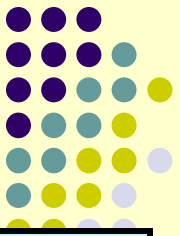
METHODS	15 TH AUG	15 TH SEP	15 TH NOV
T BUDDING	95	77	13
I BUDDING	80	54	10
CLEFT GRAFTING	70	54	10
SIDE GRAFTING	13	00	00

EFFECT OF AGE OF STOCK AND SCION ON SUCCESS PERCENTAGE OF "T" BUDDING



STOCK	scion		
	1 month	2month	3month
6 MONTH	46	53	43
12 MONTH	70	75	60
18 MONTH	53	43	40

LENGTH OF SPROUTED SHOOT 90 DAYS AFTER GRAFTING (cm) IN CORDIA



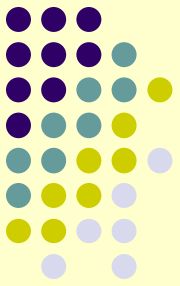
METHOD	15 TH Aug	15 TH Sep	15 TH Oct
T BUDDING	44.3	23.8	3.0
I BUDDING	33.2	20.8	2.1
CLEFT GRAFTING	24.3	18.8	1.7
SIDE GRAFTING	21.2	4.1	0.7

CULTIVARS AND PLANTING TECHNIQUE



- **GENERALLY TWO TYPES OF CULTIVARS ARE GROWN OF CORDIA**
- **LARGE FRUITED TYPE WHICH HAVE ABOUT 8.55g WEIGHT**
- **SMALL FRUITED TYPE WHICH HAVE ABOUT 3.00g WEIGHT**
- **SOME GERM PLASM HAS BEEN CLLECTED AT GUJRAT AND HISSAR FOR FURTHER EVALUATION**
- **PLANTING DISTACE KEEP 5-6 m & PITS ARE PREPARED IN JUNE.**
- **IN ARID AREAS PLANTING MOST SUITABLE IN RAINY SEASON.**
- **SMALL CATCHMENT AROUND PITS ARE PREPARED**

Growth Behaviour



Two flushes of vegetative growth take place in north India

Ist Confined in March-April

**IInd August –September
(more growth in this period)**

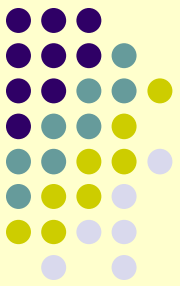
REQUIREMENT OF MANURES AND FERTILIZER



● FYM	10 KG	JAN-FEB
● N	200g	“
● P ₂ O ₅	125g	“
● K ₂ O	50g	“

Patel & Singh (2000)

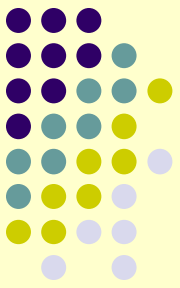
**Observed more nutrient availability
(NPK & FYM) at 0-20 cm depth than the 20-40 cm.**



WATER MANAGEMENT IN *Cordia* IN ARID CONDITION

- **YOUNG PLANTS NEED WATER 15-20 DAYS , 8-12 DAYS IN WINTER & SUMMER, RESPECTIVELY .**
- **ONE YEAR OLD PLANT CAN WITHSTAND WITHOUT IRRIGATION WITH GIVEN THE SLOPE OF 5-10 %FOR RECEIVING PRECIPITATION.**
- **HOING IS ALSO BETTER PRACTICE BEFORE RAINS**

MULCHING THROUGH LOCAL MATERIAL (Kheep & Polythene)*



REDUCE THE SOIL TEMP 1.1 to 5.6 °C IN SUMMERS

IN WINTER INCREASE TEMPERATURE 0.6 to 3.2° c

BLACK POLYTHENE CONSERVE 60 % MOISTURE

WHITE POLTHENE CONSERVE 45 % MOISUTRE

YIELD WAS 84 % HIGHER WITH BLACK

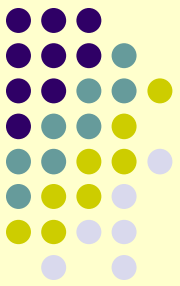
UNDER WHITE POLYTHENE 74%

YIELD WAS 66 % HIGHER WITH Cordia Mulch

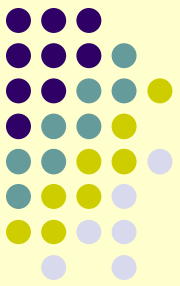
YIELD WAS 58% HIGHER WITH Kheep MULCH

(Avasthi etal., 2000)

Flowering



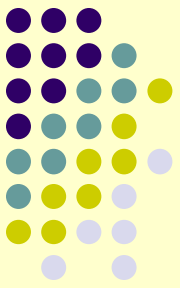
- Flowering takes place 15 March-15 April
- Fruit mature from middle of May
- Duration of flowering varied from 41-51 days
- Older shoots bear more flowers than young shoots
- The development of flower took 21 days,
- Flower open from 6-9 pm
- Maximum opening 8.0 AM
- Flower drop (98%) and fruit set (only 2%) observed
- Application of GA 3@ 100ppm at flowering produce higher fruit set (60%)



Fruiting

- **Fruiting takes 50-55days to reach maturity**
- **Mature but green fruit harvested along with stack**
- **Seeded plants bear yield after 6years**
- **Budded plants in 3-4 years**
- **Yield about 50-100 Kg in un irrigated conditions & 100-150 in irrigated conditions**

Inter-crops with cordia



Irrigated

Cordia-Wheat

Cordia-Mustard

Corida-Fenugreek

Cordia-Cumin

Un Irrigated

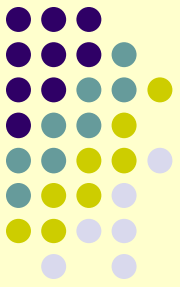
Cordia-*Mateera*

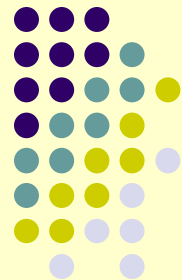
Cordia-Kachri

Cordia-Clusterbean

Cordia-Moth

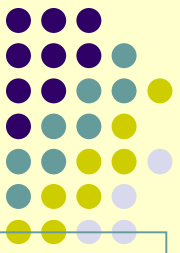
Kair (*Capparis decidua*)





VIII. Eight year old Kere plants raised by seeds growing luxuriantly

Distribution of kair crop



It is found in state Viz. Gujrat, Western Rajasthan, U.P, M.P, Haryana

It is xerophytic shrub height up to 6 m,

Growth slow , deep root system can go up to 4 m

About 234 sp are observed in world ,

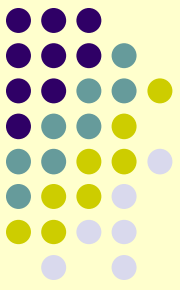
26 reported in India among them *C.decidua* is important

Leaves are smooth, linear, oblong appear only on young shoots

Brick red colour flowers on old branches or on short lateral shoots

Fruits are globular & size of a cherry, mature green & ripe fruit pinkish

Importance



- Fruits used in pickling ,vegetable,
- Ripe fruit sweet but acrid in in taste

- **Medicinal**

Fruits useful in cardiac trouble & biliousness ,gastric

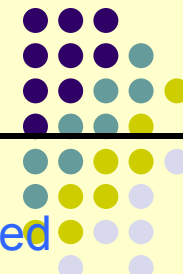
Leaves and shoots used for plastering boils

Bark is useful in cough, asthma and inflammation

- **Sand dune stabilization**

Nutrient composition of Kair

(values are on dry weight basis except moisture and Vit C)

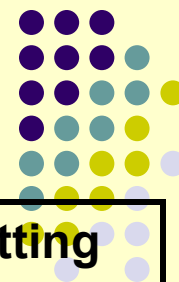


SNo.	Nutrient	Fresh Kair	Freshly Processed
1	Moisture (g)	69.5	73.7
2	Crude Protein (g)	13.9	13.6
3	Fat (g)	6.7	6.6
4	Crude fiber (g)	13.9	13.8
5	Total Ash (g)	5.9	27.3
6	Carbohydrate (g)	59.7	38.6
7	Energy (K cal)	354.5	268.8
8	Mineral (mg) Sodium	3.6	102.4
	Potassium	161.2	166.8
	Iron	2.5	2.8
	Zinc	1.5	1.42
	Manganese	2.2	2.31
	Copper	1.8	1.68
9	Vit C (mg)	50	nil

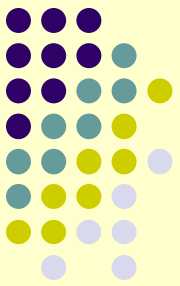
Improvement in fertility status under Ker Plantation

SOIL PROPERTIES	BARREN DUNE SAND	DUNE SAND UNDER KER
pH	8.6	7.6
Ec (ds/m)	0.3	0.4
Total N (%)	0.007	0.36
Available N (kg/ha)	87.5	168.0
Available P_2O_5 (kg/ha)	14.9	24.1
Available K (meq/100 g)	0.04	0.8

Effect of different concentrations of growth hormones on sprouting and rooting of hard wood cuttings of Kair



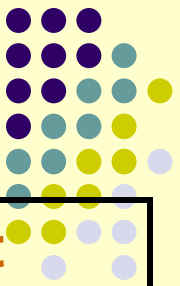
Growth hormones (ppm)		Sproutin g %	Length of longest sprout cm	Roots per cutting No.
NAA	1000	5	5.0	1.25
	2500	8	6.5	2.00
	5000	9	6.7	2.25
	7500	5	5.0	1.00
IAA	1000	3	5.0	0.75
	2500	4	5.50	1.5
	5000	6	5.75	2.25
	7500	5	4.25	0.75
IBA	1000	9	8.0	1.25
	2500	13	9.5	2.25
	7500	17	7.75	2.00



Effect of time of planting on length of shoots

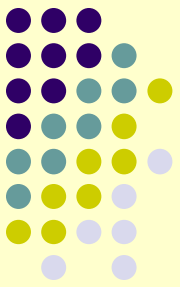
Time of planting	Length of shoots (cm) (after eight month of planting)
July	20.26
August	16.33
September	10.90
February	10.56
C.D.(0.05)	6.46

Effect of season & type of medium on sprouting of hard wood cuttings of Kair treated with 5000 ppm IBA



Type of medium	No. of sprouts per cutting		Length of longest root (cm)	
	July	Feb	July	Feb
Pure soil	3.69 (1.92)	3.5 (1.87)	5.24 (2.29)	3.5 (1.87)
Sand+FYM	10.49 (3.24)	6.81 (2.61)	13.47 (3.67)	6.55 (2.56)
Soil+FYM	6.35 (2.52)	4.54 (2.31)	9.18 (3.03)	5.24 (2.69)
CD	0.24		0.18	

Planting and manuring of Kair

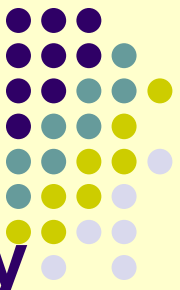


- Planting distance: 5-6 m
- Pits dug 50 cm³ size during the month of June
- Pits fill with FYM 10-20 kg , SSP 200gm, 50 gm MOP,

Manuring & Fertilizers for fully developed shrub

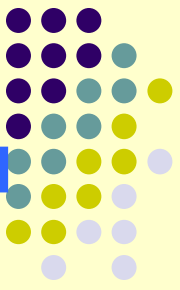
- FYM 15-20 Kg, N 200 gm P₂O₅ 200 gm, K 50 gm (N.L.Sen 2004) can increased according to soil condition

Irrigation, weeding & hoeing



Newly planted plants required watering only up to one year

- After 1 year absorb moisture from lower levels
- Mulching is beneficial in initial stage of plants
- Weeding is essential specially after rainy season
- Hoeing is also beneficial during the June July month to conserve rain water.



Flowering, fruiting and yield of kair

Flowering occurs twice a year during Feb.- March and July-August

More flowering is observed in Feb –March

Fruits harvested in march and May from flowers of Feb – March, October fruiting from July – August flowering.

It bear brick red colour flowers

One man can harvest 10 kg fruits / day

Yield

10-20 kg green in mature acrid fruits/ shrub obtained

Fresh fruits are not used directly but they should used after curing

Capers can cure or preserved in 10-15% salt in air tight container.

In initial 10 % salt is used after one week it change & this process repeated 3-4 times, then 15 % salt conc. used for longer period.

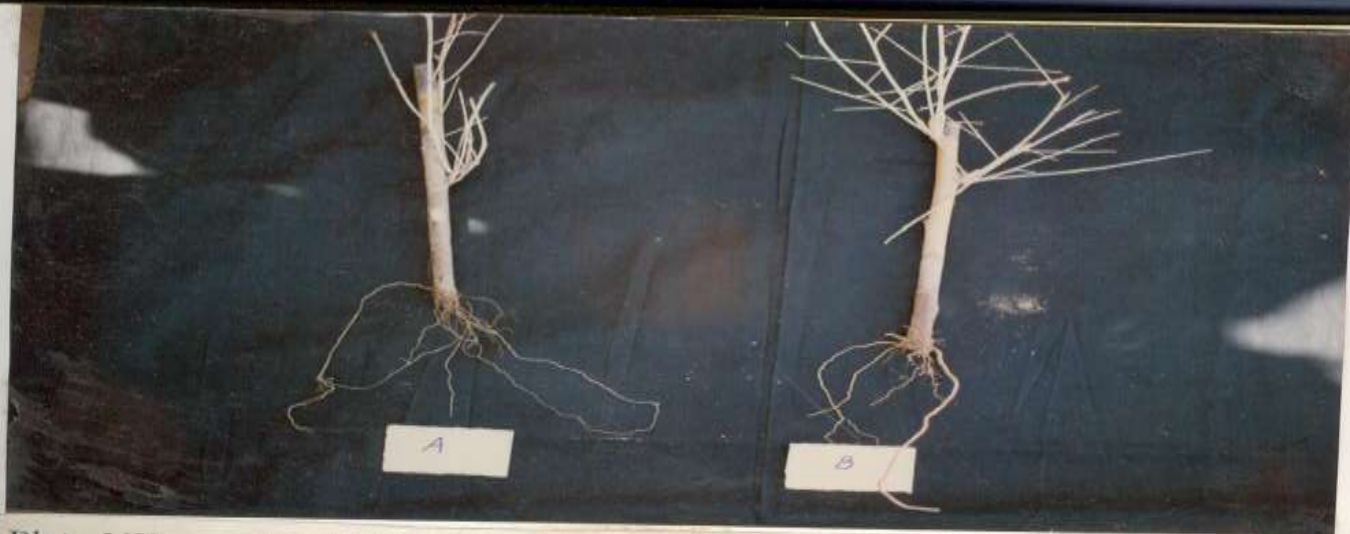
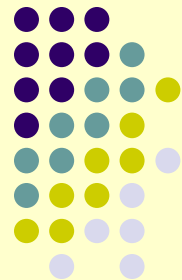


Plate VII

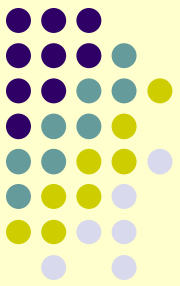
Sprouted and rooted cuttings of *Ker* treated with different concentrations of growth hormones.

(A) One year old cuttings treated with 5000 ppm IBA.



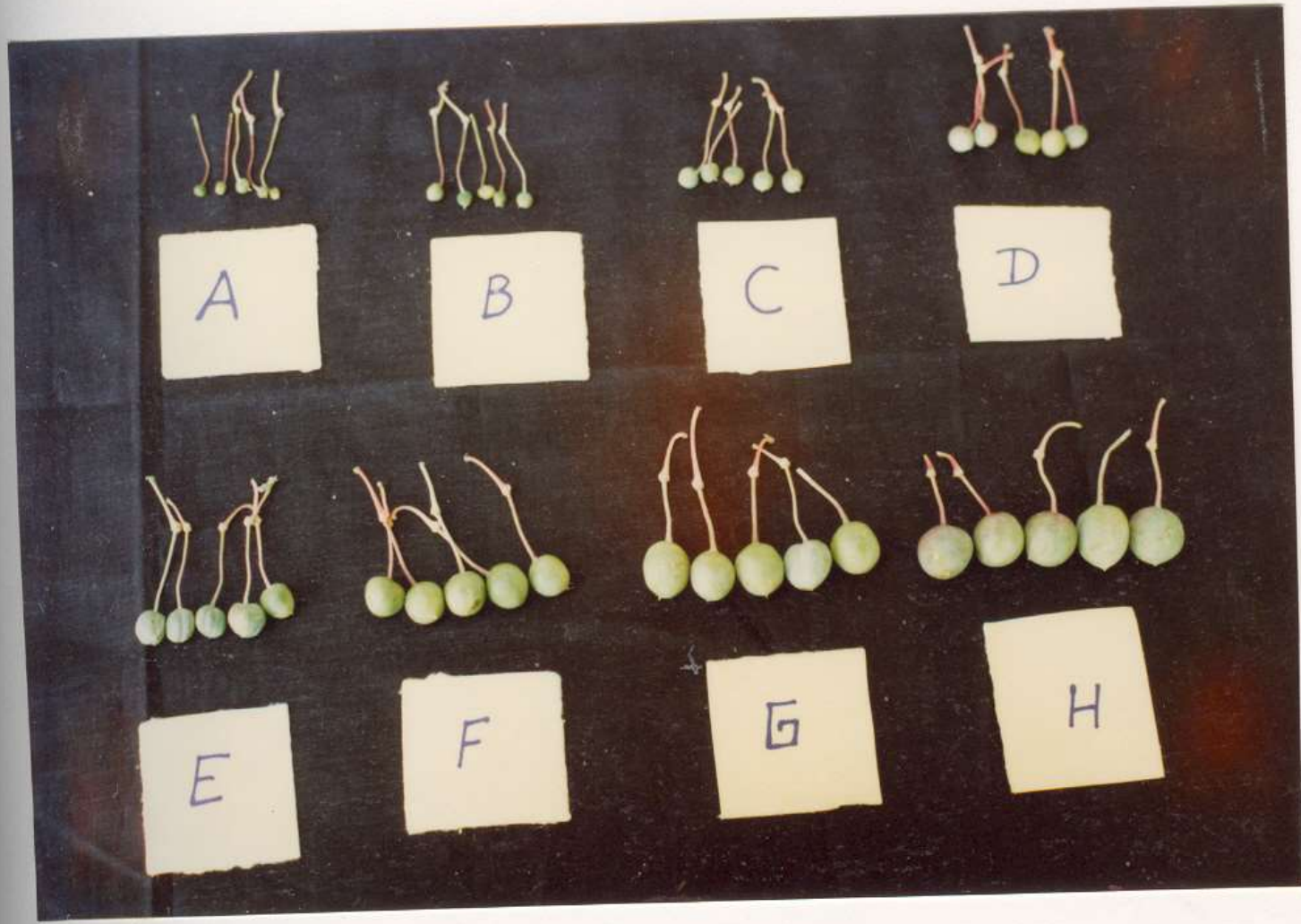
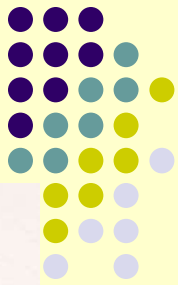
1000 ppm IBA and (e) Cuttings without any hormonal treatment.

Weight of cuttings



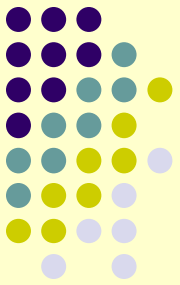
Diameter (mm) of fruits harvested after different days of fruit set

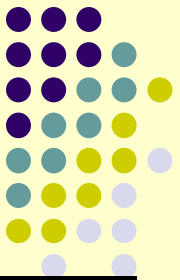
Days after fruit set	Diameter of fruit (mm)
7	4.8
10	7.7
15	9.5
20	16.8



6 K

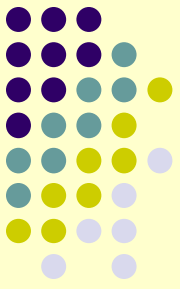






Recipe for the preparation of kair pickle

Kair cured	10 kg
Salt powder	150 gm
Red chilli (Powder)	600 gm
Cumin (whole)	200 gm
Turmeric (powder)	200 gm
Coriander (Powder)	200 gm
Amchoor (powder)	400 gm
Garlic	100 gm
Saunf	400 gm
Mustard oil	Sufficient quantity



THANKS