

A pair of hands is shown from a top-down perspective, cupping a small, vibrant green seedling with several leaves. The seedling is growing out of a mound of dark, rich soil. The background is a soft, out-of-focus light color, making the hands and the plant the central focus of the image.

TECHNICAL BULLETIN ON FERTIGATION

**National Committee on Plasticulture Applications in Horticulture (NCPAH)
Ministry of Agriculture, GOI
New Delhi-110001**

Introduction

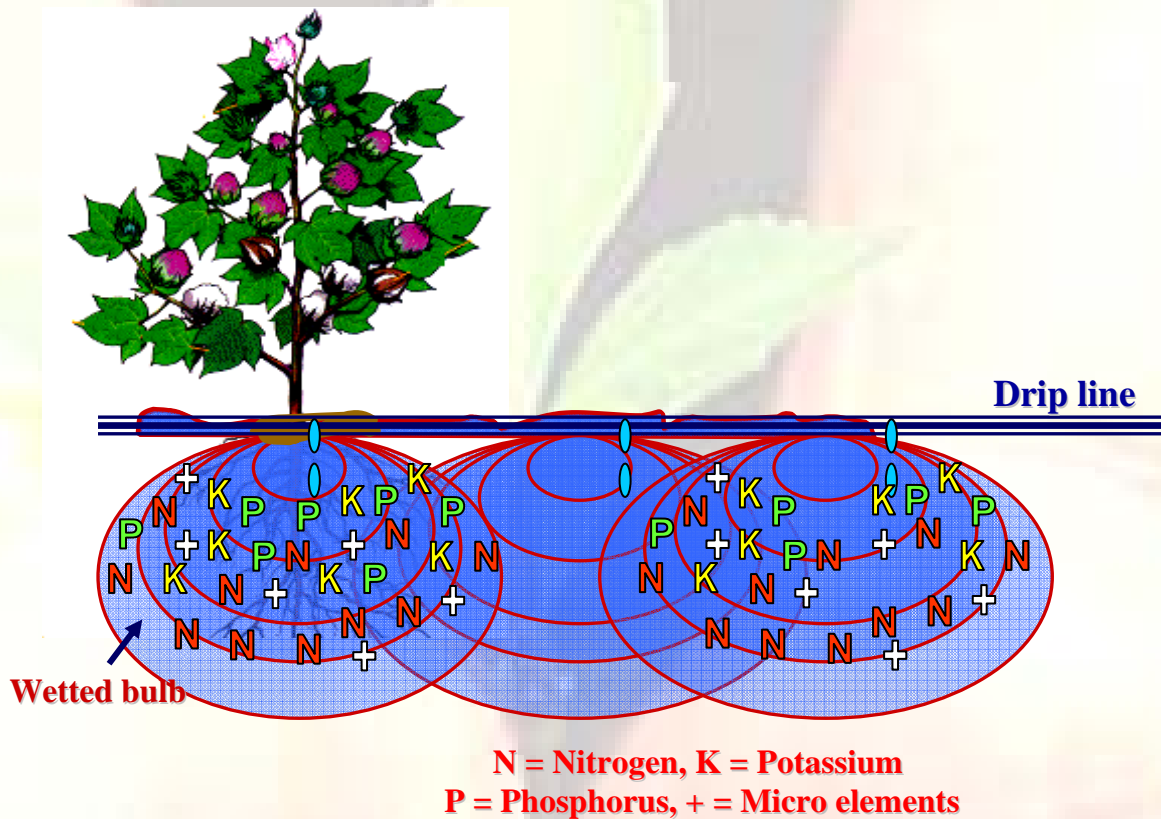
India is poised to play a major role in increasing the utility of land water and other natural resources to compete with the increasing rate of population. Farmers today are faced with the challenge of meeting an ever-increasing demand for a wide range of high quality and safe foods. But these demands must be satisfied in economically viable ways whilst safeguarding natural resources and protecting the environment. Intensification of agriculture by irrigation and enhanced use of fertilizers may generate pollution by increased levels of nutrients in underground and surface waters. Therefore judicious management of plant nutrients available through different fertilizers need be catered. A higher efficiency is possible with the help of pressurized irrigation system is placed around the plant roots uniformly and allow for rapid uptake of nutrients by the plant.. 'Fertigation' is the technique of supplying dissolved fertilizer to crops through an irrigation system. Small applications of soluble nutrients saves labour, reduces compaction in the field, thereby enhancing productivity.

Need for Fertigation

- Uneven growth in fertilizer consumption resulting in state-wise crop-wise variation in consumption.
- Mining of nutrients from the soil at alarming rate (soil fertility depletion due to inadequate and imbalanced fertilizer use).
- Decline in crop response to fertilizer
- Stagnation in fertilizer production.
- Weakening relationship between fertilizer use and foodgrain production
- Increasing dependence on fertilizer imports.

Fertilizers are chemical compounds (liquid or granular) which provides essential plant nutrients to the plants to promote growth. They are either applied through the soil or with irrigation water.

Fertigation is method of applying fertilizers, soil amendments and other water soluble products required by the plant during its growth stages through drip /sprinkler irrigation system.



Schematic View of Distribution of Plant Nutrients

Advantages of Fertigation:

1. Increase in yield by 25-30%
2. Saving in fertilizers by 25-30%
3. Precise application and uniform distribution of fertilizers
4. Nutrient can be applied as per plant requirements
5. Acidic nature helps in avoiding clogging of drippers, it cleans drip system.
6. Minimizes nutrient losses.
7. Major & micro nutrients can be applied in one solution with irrigation.
8. Fertilizers can be injected as per required concentration
9. Saving in time, labour, energy
10. Light soils can be brought under cultivation.

Fertilizers suitable for Fertigation

S. No.	Fertilizer	N --- P --- K
1	Urea	46 - 0 - 0
2	Ammonium Nitrate	34 - 0 - 0
3	Ammonium Sulphate	21 - 0 - 0
4	Calcium Nitrate	16 - 0 - 0
5	Magnesium Nitrate	11 - 0 - 0
6	Urea Ammonium Nitrate	32 - 0 - 0
7	Potassium Nitrate	13 - 0 - 46
8	MAP	12 - 61 - 0
9	Potassium Chloride	0 - 0 - 60
10	Potassium Nitrate	13 - 0 - 46
11	Potassium Sulphate	0 - 0 - 50
12	Potassium Thiosulphate	0 - 0 - 25
13	MKP	0 - 52 - 34
14	Phosphoric Acid	0 - 52 - 0
15	NPK	19 - 19 - 19 20 - 20 - 20

Characteristics of Fertilizers suitable for Fertigation

- High nutrient content readily available to plants.
- Fully water soluble at field temperature conditions.
- Fast dissolution in irrigation water.
- No clogging of filters and emitters.
- Low content of insolubles (< 0.02%).
- Minimum content of conditioning agents.
- Compatible with other fertilizers.
- Minimal interaction with irrigation water.
- No drastic changes of water pH (3.5 < Ph > 9.0).
- Low corrosives for control head and system.

National Committee on Plasticulture Applications in Horticulture (NCPAH)

Solubility of Fertilizers: The quantity of fertilizer that can be dissolved in unit quantity of water is called the solubility. The solubility is greatly affected by the temperature variations. Normally these values are taken for 20° C.

Types of fertilizers:

- a. **Nitrogenous Fertilizers:** These fertilizers are most commercially available and readily soluble in water and hence treated as good fertigating agents.

Solubility of Nitrogenous Fertilizers

Type of Fertilizer	Nitrogen content (%)	Solubility (gm/liter)
Ammonium sulphate	21	750
Urea	46	1100
Ammonium nitrate	34	1920
Calcium nitrate	15.5	1290

Characteristic of Nitrogenous Fertilizers suitable for Fertigation

Fertilizers	Grade	Formula	pH (1 g/L at 20°C)
Urea	46 - 0 - 0	CO(NH ₂) ₂	5.8
Potassium nitrate	13 - 0 - 46	KNO ₃	7.0
Only fertigation grade			
Ammonium sulfate	21 - 0 - 0	(NH ₄) ₂ SO ₄	5.5
Urea ammonium nitrate	32 - 0 - 0	CO(NH ₂) ₂ . NH ₄ NO ₃	
Ammonium nitrate	34 - 0 - 0	NH ₄ NO ₃	5.7
Mono ammonium phosphate	12 - 61 - 0	NH ₄ H ₂ PO ₄	4.9
Calcium nitrate	15 - 0 - 0	Ca(NO ₃) ₂	5.8
Magnesium nitrate	11 - 0 - 0	Mg(NO ₃) ₂	5.4

- b. **Potassic fertilizers:** Potassic fertilizers are best suited for fertigation

Solubility of Potassic Fertilizers

Fertilizer	K content (%)	Solubility (gm/liter)
Potassium sulphate	50	110
Potassium chloride	60	340
Potassium nitrate	44	133

Characteristics of Potassium Fertilizers suitable for Fertigation

Fertilizers	Grade	Formula	pH (1 gm / L at 20°C)	Other nutrients
Potassium chloride [@]	0 - 0 - 60	KCl	7.0	46 % Cl
Potassium nitrate	13 - 0 - 46	KNO ₃	7.0	13 % N
Potassium sulfate [#]	0 - 0 - 50	K ₂ SO ₄	3.7	18 % S
Potassium Thiosulphate [*]	0 - 0 - 25	K ₂ S ₂ O ₃	-	17 % S
Monopotassium phosphate	0 - 52 - 34	KH ₂ PO ₄	5.5	52 % P ₂ O ₅

[@] Only White [#] Only Fertigation grade ^{*} Liquid

c. Phosphatic fertilizers:

- P+Ca=Calcium phosphate (insoluble)
- P+Ammonium+Magnesium=Magnesium ammonium phosphate(Insoluble)
- P+Iron=Iron phosphate (insoluble)
- Even good P sources like poly phosphates gets precipitated if Ca+Mg in water is >50 ppm and Bicarbonate>150ppm. If Bicarbonate content is <100ppm, the Ca+ Mg content can go upto 75ppm

Characteristics of Phosphorus Fertilizers suitable for Fertigation

Fertilizers	Grade	Formula	pH (1 g/L at 20oC)
Phosphoric acid	0 - 52 - 0	H ₃ PO ₄	2.6
Mono-potassium phosphate	0 - 52 - 34	KH ₂ PO ₄	5.5
Mono ammonium phosphate	12 - 61 - 0	NH ₄ H ₂ PO ₄	4.9

Micronutrients: are elements which are essential for plant growth which are required in smaller amounts than primary nutrients such as N, P and K.

Solubility of Micronutrient Fertilizers

Fertilizer	Content (%)	Solubility (gm / liter)
Solubor	20 B	220
Copper sulphate	25 Cu	320
Iron sulphate	20 Fe	160
Magnesium sulphate	10	710
Ammonium molybdate	54	430
Zinc sulphate	36	965
Manganese sulphate	27	1050

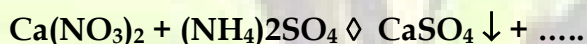
National Committee on Plasticulture Applications in Horticulture (NCPAH)

Compatibility: Mixing the solutions of two or more than two water soluble fertilizers can sometimes result in the formation of a precipitate. Their solutions should be prepared in two separate tanks.

Interaction between fertilizers nutrients - Compatibility

When preparing fertilizer solutions for fertigation, the solubility product of the different materials must be taken into consideration. Fertilizers mixtures in the tank which reduce the solubility of the mixture due to formation of precipitates:

a) Calcium nitrate with any sulfates = formation of CaSO₄ precipitate (gypsum)



b) Calcium nitrate with any phosphates = formation of Ca phosphate precipitate



c) Magnesium with mono- ammonium phosphate = formation of magnesium phosphate precipitate



d) Ammonium sulfate with KCl or KNO₃: formation of K₂SO₄ precipitate



e) Phosphorus with iron = formation of iron phosphates precipitate

Compatibility chart for different water soluble fertilizers

Fertilizers T	Urea	Ammonium Nitrate	Ammonium Sulphate	Calcium Nitrate	Mono Ammonium Phosphate	Mono Potassium Phosphate	Potassium Nitrate
Urea		C	C	C	C	C	C
Ammonium Nitrate	C		C	C	C	C	C
Ammonium Sulphate	C	C		LC	C	C	LC
Calcium Nitrate	C	C	LC		NC	NC	C
Mono Ammonium Phosphate	C	C	C	NC		C	C
Mono Potassium Phosphate	C	C	C	NC	C		C
Potassium Nitrate	C	C	L	C	C	C	

C- Compatible, NC = Not Compatible LC = Limited compatible

Fertilizer Evaluation for Suitability to Fertigation

Property	NH ₄ NO ₃	(NH ₄) ₂ SO ₄	K ₂ SO ₄	KCl	KNO ₃	H ₃ PO ₄	MAP
Solubility	High	Medium	Low	Medium	Medium	High	Medium
Precipitation	Low	High	High	Low	Low	Low	High
Compatibility	Good	Poor	Poor	Medium	Medium	Medium	Good
Corrosion	Medium	Poor	Poor	Poor	Good	Poor	Medium

Cooling Effect on Dissolution: Some fertilizers specially, cool down the temperature of water during dissolution resulting in reduced solubility of the fertilizer. The fertilizers resulting in lowering the water temperature are urea, ammonium nitrate, calcium nitrate and potassium nitrate.

Chemical Aspects of Fertigation

1. Solubility limits of the least soluble salt in solution
2. Precipitation of Ca-Mg/P compounds:
 - a) Clogging of drippers and filters
 - b) Less nutrient availability
3. Corrosivity

Corrosivity of Fertilizers

Kind of metal	Ca(NO ₃) ₂	(NH ₄) ₂ SO ₄	NH ₄ NO ₃	Urea	H ₃ PO ₄	DAP
Galvanized iron	2	4	4	1	4	1
Sheet aluminium	No	1	1	No	2	2
Stainless steel	No	No	No	No	1	No
Bronze	1	3	3	No	2	4
Brass	1	2	3	No	2	4

No = None; 1 = Slight; 2 = Moderate; 3 = Considerable; 4 = Severe

Fertilizer solubility and compatibility Fertilizers

- a. Must be dissolved (not suspended)
 - dissolved means that it can not be filtered out
 - b. Do a "Jar Test" for fertilizer compatibility
 - get a sample of the water and mix the nutrients in proportion
 - wait and watch for precipitation
 - c. Solid fertilizers vary in their dissolution rate and the amount that can be dissolved in water
 - d. Fertilizer solubility increases at higher water temperatures
4. Decomposition of chelates under extreme pH values

National Committee on Plasticulture Applications in Horticulture (NCPAH)

5. Cooling effect with mixing (mixing order)

Methods of Fertilizer Application

Field Crops

- Broadcasting
- Surface incorporation
- Deep placement
- Foliar application
- Fertigation

Orchard Crops

- Soil application in rings
- Foliar application
- Insertion in trunk

Fertilization methods



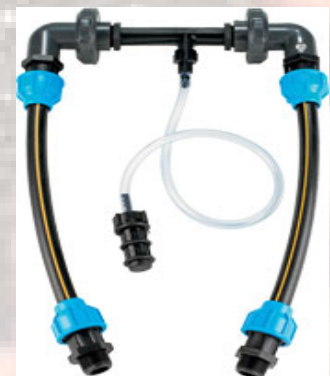
Fertigation Equipments:

1. Ventury Injector

This is very simple and low cost device.

A partial vacuum is created in the system which allows suction of the fertilizers into the irrigation system through ventury action.

The vacuum is created by diverting a percentage of water flow from the main and pass it through a constriction which increases the velocity of flow thus creating a drop in pressure. When the pressure drops the



National Committee on Plastics Applications in Horticulture (NCPAH)

fertilizer solution is sucked into the ventury through a suction pipe from the tank and from there enters into irrigation stream. The suction rate of ventury is 30 to 120 lit. per hour.

2. Fertilizer Tank

In this system part of irrigation water is diverted from the main

line of flow through a tank containing the fertilizer in a fluid or soluble solid form, before returning to the main line, the pressure in the tank and the main line is the same but a slight drip in pressure is created between the off take and return pipes for the tank by means of a pressure reducing valve. This causes water from main line to flow through the tank causing dilution and flow of the diluted fertilizer into the irrigation stream. With this system the concentration of the fertilizer entering the irrigation water charges continuously with the time, starting at high concentration. As a result uniformity of fertilizer distribution can be a problem. Fertilizer tanks are available in 90,120,160 liters capacity.



Features and Specifications

- Mild steel construction.
- Powder coated with more than 70 micron thick deep blue coloured epoxy polyester from both inside and outside surface for protection against corrosion and weather effects.
- Turbulent inlet ensures thorough mixing of chemicals and /Fertilizers.
- Separate valves are provided on the inlet & outlet to control the injection rate.
- Special provision of strainer on the outlet.
- Drain port to flush the tank.
- Maximum working pressure 10 kg/cm² (142 psi).
- Available in 30, 60, 90, 120 & 160 liters (8, 16, 24, 32 & 42 US gallon) capacity.

3. Fertilizer Injector Pump:

These are piston or diaphragm pumps which are driven by the Water pressure of the irrigation system and such as the injection rate is proportional to the flow of water in the system. A high degree of control over the fertilizer injection rate is possible, no serious head



National Committee on Plasticulture Applications in Horticulture (NCPAH)

losses are incurred and operating costs are low. Another advantage is that if the flow of water stops. Fertilizer injection also automatically stops. This is perfect equipment for accurate fertigation. Suction rates of pumps vary from 40 lit to 160 liters per hour.

4. Manifold - Fertigation - Features and Specifications

- Available in 1½", 2", 2½" and 3" BSP Female threaded inlet connections.
- Available in inlet/outlet sizes of ¾", 1" 1¼", 1½" and 2" suitable for required fertigation equipment
- Any other size or end connection available on demand.



Application

Convenient and quick attachment of venturi injector, fertilizer tank and injector pump to irrigation system.

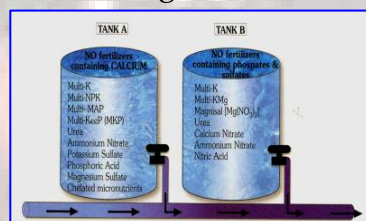
Comparative performance of Fertigation equipments

Property	Fertilizer tank	Venturi Injector	Fertilizer pumps
Ease of operation	High	Medium	Low
Use of solid fertilizer	+	*	
Use of liquid fertilizer	+	+	
Discharge rate	High	Low	High
Concentration control	None	Medium	Good
Volume control	Good	Medium	Good
Head loss	Low	Very high	
Automation	Low	Medium	High
Price	Low	Medium	high

**Use liquid solutions or prepare a solution by dissolving solid fertilizers.*

Recommended combinations of Water soluble fertilizers:

Use of two or more fertilizer tanks separates fertilizers that interact and cause precipitation. Placing in one tank the Ca, Mg & micro-nutrients, and in the other tank the Phosphorus and Sulphate compounds, enables safe and efficient fertigation shown in fig.



Stock solution of fertilizer

Fertilizers commonly used in Fertigation

Micronutrients

Inorganic salts: Sulfates of Fe-Zn-Mn-Cu become rapidly unavailable in the soil react with Ca and P and form precipitates in the irrigation laterals. This is reduced availability and clogs the drippers.

Preparing Fertilizer Stock Solutions at Field Conditions

Commercial liquid / solid feeds are available – but it is cheaper to mix own recipes from single nutrients. The formula can be tailored specifically. Various ratios of N:P:K solutions can be prepared at the farmer’s field. Tailor made nutrient solutions, gaining full flexibility to meet plants needs. This is very simple, precise and cheap fertigation.

HOW TO PREPARE STOCK SOLUTION NPK?

Type	N:P ₂ O ₅ :K ₂ O ratio	Composition (%)			Quantity added (kg/100 L tank)				
		N	P ₂ O ₅	K ₂ O	Urea	A.S.	P.A.	MKP	KCl
NPK	1-1-1	3.3	3.3	3.3	7.2	-	5.3	-	5.4
	1-1-1	4.4	4.6	4.9	9.6	-	-	8.8	3.0
	1-2-4	2.2	4.8	8.9	4.8	-	7.7	-	14.6
	3-1-1	6.9	2.3	4.3	15.0	-	3.7	-	7.0
	3-1-3	6.4	2.1	6.4	13.9	-	4.0	-	8.2
	1-2-1	2.5	5.0	2.5	5.4	-	8.1	-	4.1
NK	1-0-1	4.6	0	4.6	10.0	-	-	-	7.5
	1-0-2	1.9	0	3.9	-	9.0	-	-	6.4
	2-0-1	5.8	0	2.9	12.6	-	-	-	4.8
PK	0-1-1	0	5.8	5.8	-	-	9.4	-	9.5
	0-1-2	0	3.9	8.0	-	-	-	7.5	8.9
K	0-0-1	0	0	7.5	-	-	-	-	12.3

Limitations & Precautions of Fertigation

- Fertilizer suitability - Only completely water soluble fertilizers interaction of injected chemicals with irrigation water resulting in formation of precipitates which clog the emitters.
- Incorrect application may cause damage to crop, leaching of nutrients and contamination of groundwater.
- Knowledge of fertilizer compatibility while mixing is necessary.

National Committee on Plasticulture Applications in Horticulture (NCPAH)

- Correct operation of irrigation system is required.
- Corrosion of irrigation & injection system components.
- Toxicity of water when water source is linked to potable water supply.

Points to remember for adopting Fertigation

1. Fertilizer tank or injection pump may be used to inject the fertilizer
2. For precise placement of both water and fertilizer, it is necessary to use pressure compensating drippers or inline drippers instead of micro tubes.
3. Daily feeding is most desirable, if not possible feed alternate day.
4. Urea can be combined with WSF for meeting the N requirements.
5. Fertigation should be done during the end of irrigation period, run the drip system for 5-6 minutes after the completion of fertigation.
6. It is not advisable to use a very concentrated stock solution (generally not more than 10%).
7. The fertilizer solution should be compatible with the quality of water into which it is being injected.
8. Do not inject fertilizers in combination with pesticides or chlorine
9. The injection point must be upstream of the filter system so that the filter will remove any un-dissolved fertilizer or precipitates that occur
10. Select fertilizer solutions to help adjust water pH if necessary.
11. The time needed to distribute the fertilizer should be less than the time needed to supply enough water to the field.
12. Do not over irrigate because this will leach some of the fertilizer out of the root zone.

Water soluble fertilizers and their suitability to different horticultural crops

Product Name	Specific formulae	Crops	Remarks	Name of the manufacturer
Multi- NPK	13-3-43(NPK)	For all crops	Should not be mixed with calcium or magnesium fertilizers	Haifa chemicals
Poly-feed drip	15-30-15 + 2MgO 19-19-19 + 1MgO 14-7-28 + 2MgO	Open field and Green house crops	It is enriched with Mg, Fe, Mn, B, Zn, Cu, Mo	Haifa chemicals
Multi- micro	7.1% Fe + 3.48% Mn + 1.02% Zn + 0.76% Cu + 0.49 % Mo	Field crops, vegetables and fruit trees	The chelated forms ensures stability and plant availability of the micro nutrients even in alkaline soils	Haifa chemicals
Multi-K	13-00-45	All fruits and plantation	Non-volatile, easy to apply with no nitrogen losses to the atmosphere	Haifa chemicals
Sulphate of Potash (SOP)	00-00-50 +17.5	Fruits and vegetables	Non hygroscopic and absence of chloride	Haifa chemicals

Fertilizer injection schedules for mulched and drip irrigated vegetables

Crop	Estab. Method	Typical bedspacing (m)	Rows per bed	Total Nutr. (kg/ha) ^Z		Crop Development		Injection rate (7days) kg/ha	
				N	K ₂ O	Stage	Weeks ^{yx}	N	K ₂ O
1	2	3	4	5	6	7	8	9	10
Broccoli	TP	1.5	2	150	125	1	1	12.25	10.50
						2	9	15.75	14.00
(Cantaloupe) Muskmelon	TP	2	1	150	150	1	2	7.00	7.00
						2	3	14.00	14.00
						3	3	17.50	17.50
						4	2	14.00	14.00
						5	2	7.00	7.00
Cauliflower	TP	1	2	175	150	1	1	14.00	12.25
						2	9	17.50	15.75
Cucumbers	S	1.5	2	150	120	1	1	7.00	7.00
						2	2	14.00	10.50
						3	6	17.50	14.00
						4	1	14.00	10.50
Eggplant	TP	1	1	160	160	1	2	7.00	7.00
						2	2	10.50	10.50
						3	6	17.50	17.50
						4	3	10.50	10.50
Okra	S	1.2-1.5	2	150	150	1	2	7.00	7.00
						2	2	10.50	10.50
						3	8	14.00	14.00
						4	1	10.50	10.50
Onion	TP	2	6-10	150	150	1	2	7.00	7.00
						2	4	10.50	10.50
						3	4	14.00	14.00
						4	4	10.50	10.50
						5	1	7.00	7.00
						6	1	7.00	7.00
Pepper	TP	1.2	2	175	160	1	2	7.00	7.00
						2	2	10.50	10.50
						3	7	17.50	17.50
						4	1	10.50	7.00
						5	1	7.00	7.00

National Committee on Plasticulture Applications in Horticulture (NCPAH)

Crop	Estab. Method	Typical bedspacing (m)	Rows per bed	Total Nutr. (kg/ha) ^Z		Crop Development		Injection rate (7days) kg/ha	
				N	K ₂ O	Stage	Weeks ^{yx}	N	K ₂ O
1	2	3	4	5	6	7	8	9	10
Pumpkin	S	8	1	120	120	1	2	7.00	7.00
						2	2	10.50	10.50
						3	4	14.00	14.00
						4	2	10.50	10.50
						5	1	7.00	7.00
Tomato	TP	6 feet	1	175	225	1	2	7.00	10.50
						2	2	10.50	14.00
						3	7	17.50	21.00
						4	1	10.50	14.00
						5	1	7.00	10.50
Watermelon	S	8 feet	1	150	150	1	2	7.00	7.00
						2	2	10.50	10.50
						3	4	17.50	17.50
						4	3	10.50	10.50
						5	2	7.00	7.00

^Z Includes any starter fertilizer.

^y Where 20% of N and K₂O have been applied as starter, then first one or two week's injections can be omitted.

^x For extended-season crops, N maintenance applications can proceed at 5.0 to 7.5 kg. per ha per week. Tissue testing should be used to fine-tune amount

Required dose of Phosphorus will be given as Basal dose

TP - Transplanting, S - Sowing,

Source: IIHR, Bangalore

Conclusion: In the age of competitive global market, in order to make sustainable agriculture/horticulture production. The adequate and economic use of various fertilizers consumed by a plant during its different growth stages need be catered with feasible techno-economic practices which will improve soil health and increases crop response. “Fertigation technique” is the need of the hour. It is the most critical activity to harvest quality produce at a competitive price. It also enhances the crop productivity. Thus efficient use of irrigation water and fertilizer through fertigation needs to be adopted on a large scale by the growers in India. This booklet contains information on various aspects of fertilizers and fertigation and equipments used for fertigation which will provide help in adoption of fertigation technique various stakeholders.

National Committee on Plasticulture Applications in Horticulture (NCPAH)

Fertilizer Manufacturers

S. NO.	NAME & ADDRESS	CONTACT DETAILS
1	Zuari Industries Ltd. Registered Office : Jai Kisaan Bhawan, Zuarinagar, Goa – 403 726	Tel: +91-832- 2592180 Fax No : +91-832- 2555462, 2555279 Web : www.zuari-chambal.com
2	Chambal Fertilizers and Chemicals Limited Corporate Office : International Trade Tower, 3rd Floor, Block-F, Nehru Place, New Delhi- 110 019	Tel : +91-11-26462162, 41697900 Fax : +91-11-26465218, 26480639 Web: www.uttamkrishi.com
3	DCM Shriram Consolidated Ltd. Regd. Office: 6th Floor, Kanchenjunga Building,18, Barakhamba Road, New Delhi-110 001 Corporate Office : 5th Floor, Kanchenjunga Building, 18, Barakhamba Road, New Delhi- 110 001 Delhi Office : Kirti Mahal, 19 Rajendra Place, New Delhi-110 008	Tel: +91-11-23316801 Fax: +91-11-23318261, 23318072 Web : www.dscl.com Email : dscl@dscl.com ; ajay.shriram@dscl.com
4	Indian Farmers Fertiliser cooperative Ltd Corporate Office: 34, Nehru Place New Delhi, 110019, India	Tel : +91-11-26432507, 26432510 Fax : +91-11-26463833 EMail : mdoffice@iffco.nic.in
5	Gujarat Narmada Valley Fertilizers Company Limited Regd. Office: PO: Narmadanagar - 392015, Dist. : Bharuch (Gujarat), India Corporate Office: PO: Narmadanagar - 392015, Dist. Bharuch (Gujarat), India Delhi Office: GNFC Ltd., C-1/3, Safdarjung Development Area, Aurbindo Marg, New Delhi – 110019	Tel. : (02642) 247134 Fax : (02642) 247057 E-Mail : grbdesai@gnvfc.in Web: http://gnvfc.guj.nic.in , http://www.gnvfc.com
6	Indo German Company Ltd. Corporate Office : P.O. BOX 17028, AMMAN 11195, JORDAN	Tel : (962-6) 5512872 Fax : (962- 6) 5512871 Web : www.indo-jordan-chemicals.com ijcamman@go.com.jo
7	Tata Chemicals Limited 24 Homi Mody Street, Fort, Mumbai 400 001	Tel: +91-22-56658282 Fax: +91-22-56658143
8	Gujarat State Fertilizers & Chemicals Ltd. P.O. Fertilizer Nagar - 391750, Dist. Vadodara, Gujarat, India	Tel: 91-0265-2242451, 2242451, 2242651 Fax: 91-0265-2240966, 2240119 Web: www.gsfclimited.com E-mail: info@gsfcLtd.com
9	Brahmaputra Valley Fertilizer Corporation Ltd. P. O. Parbatpur, Dist. Dibrugarh – 786623, Assam, India	Tel: 91-0374-2500236 Fax: 91-0374-2500317 E-mail: bvfclnam@bsnl.in Web: www.bvfcl.com
10	OCP GROUP 2-4, Rue Al Abtal, Hay Erraha Ex Angle Route D'El Jadi da ET BD, DE LA Grande Ceinture, BP 5196-Casablanca	Tel: 212 22 230025, 230125, 231025 Fax: 21753 22035 22069 Web: www.ocpgroup.ma

National Committee on Placticulture Applications in Horticulture (NCPAH)

Fertilizer Manufacturers

S. NO.	NAME & ADDRESS	CONTACT DETAILS
11	MMTC Ltd. Core I, SCOPE Complex, 7, Institutional Area, Lodhi Rd., New Delhi 110003, India	Tel: 91-011-24362200 Fax: 91-011-24362196 Web: www.mmtc.com
12	Krishak Bharati Co-operative Ltd. A-10, Sector - I , NOIDA, Gautam Buddh Nagar, Uttar Pradesh - 201301, India	Tel: 91-0120-2534613 Fax: 91-0120-2537113 E-mail: cpsingh@kribhco.net Web: www.kribhco.net
13	Duncans Industries Ltd. (Fertiliser Division) 16,Siri Fort Marg, II nd Floor (Near Sadiq Nagar), New Delhi - 110049, India	Tel : 91-011-26264008 Fax : 91-011-26264007 Web: www.duncansfertiliser.com
14	Indo Gulf Fertilisers Ltd. (A unit of Aditya Birla Nuvo Ltd.) P.O. Industrial Area, Jagdishpur, Dist. Sultanpur - 227817, Uttar Pradesh, India	Tel : 91-05361-270032-38 Fax : 91-05361-270165 Web: www.indo-gulf.com E-mail: igfl@adityabirla.com
15	Godavari Fertilisers & Chemicals Ltd. Beach Road, Kakinada - 533003, Andhra Pradesh, India	Tel : 91-0884-2372341 Fax : 91-0884-2361069 E-mail: hyd1_gfcl@sancharnet.in
16	Nagarjuna Fertilizers and Chemicals Limited Nagarjuna Hills, Punjagutta, Hyderabad - 500 082, Andhra Pradesh, India	Tel : 91-40-23357200 / 7204 Fax : 91-40-23354788 Web: www.nagarjunafertilizers.com E-mail: corp@nagarjunagroup.com
17	Paradeep Phosphates Limited Pt. Jawaharlal Nehru Marg, Bhubaneswar – 751 001, Orissa,India	Tel : 91-674-2393931 Fax : 91-674-2392631 Web: www.paradeepphosphates.com E-mail: mail@paraphos.com
18	Shree Annpurna Agrotech Near Sh. Sadan, Fatehpur-Shekhawati-332301 Dist. Sikar (Raj)	Tel: 01571-231023
19	Deepak Fertilizers & Petrochemicals Corp. Ltd. Opp. Golf Course, Yerawada, Pune-411006	Tel: 91 20 66458118, 20 66458000 Fax: 0 20 26683727 E-mail: manoj@deepakfertilisers.com Web: www.dfpcl.com
20	A.K. Vasudeva Kheti Sewa Centre Nirankari Market, Chowk Bharat Nagar, Ludhiana- 141001	Tel: 0161 2409064
21	M/s. Shroff Agritech Services Tal: Dahanu, Dist: Thane:401103	Tel: 02528 244362 E-mail: shroffnilesh@yaho.co.in
22	Sayed Arshad Jamal Arushi Gram Udyog Sansthan K-61, Abul Fazal Enclave, Jamia Nagar, Okhla, New Delhi-110025	Tel: 011 26955816 E-mail: arushi_gramudyog@yahoo.com Web: www.arushigramudyog.com
23	Kapil Jeenwal Morco 110, Shikha Apartments, 48, I.P. Extension, Delhi-110092	E-mail: morcosales@gmail.com

National Committee on Plasticulture Applications in Horticulture (NCPAH)

Suppliers of Water Soluble Fertilizers

S. NO.	NAME & ADDRESS	CONTACT DETAILS
1	Vanashree Agrotech, Pune J-116, Megacentre, Magarpatta, Solapur Road, Hadapsar, Pune, Maharashtra - 411 028, India	Tel: +(91)-(20)-26995697/26823767 Fax: +(91)-(20)-26823767 Web: www.vanashreeagrotech.com E-mail: alot25@gmail.com , alot@rediffmail.com
2	Scientific Agriculture Laboratory 3/321, KaviMani Street, Indian Bank Colony, Narayanapuram, Madurai, Tamil Nadu - 625 014, India	Tel: +(91)-(452)-2680112/2631771 Fax: +(91)-(452)-2681610 Web: www.indiamart.com/sal
3	Mag Excel Exports Private Limited 45, Royapettah High Road, Chennai, Tamil Nadu - 600 014, India	Tel: +(91)-(44)-28131463/28131483/28133782 Fax: +(91)-(44)-28133783 Web: www.magexcel.com E-mail: inbox@magexcel.com
4	Moonak Fertilizers Near Bus Stand, Village Dehla Road, Moonak, Punjab - 148 033, India	Tel: +(91)-(1676)-276844/276833 Fax: 0 1676 27683
5	East Coast Seaweed Inc 19, Veeran Street, Tirumangalam, Madurai, Tamil Nadu - 625 706, India	Tel: +(91)-(4549)-282910 Fax: +(91)-(4549)-284576 Web: www.seeweedinida.com E-mail: bangaar@rediffmail.com
6	V Kumar And Sons 13/C/3, Estee Appartment Saibaba Nagar, Borivali West, Mumbai, Maharashtra - 400 092, India	Tel: +(91)-(22)-28617504/28062744 Fax: 022 28617504 Web: www.indiamart.com/vkumarandsons E-mail: vkumarandsons@gmail.com
7	K. S. Trading Company Punarnava Bhavan 13 BB Ganguly Street, 5th Floor, RoomNo-505, Kolkata, West Bengal - 700 012, India	Tel: +(91)-(33)-22256144 Fax: +(91)-(33)-22252872 Web: www.sroyindia.com E-mail: skr@sroyindia.com
8	AVA Chemicals Private Limited 1/20 B, Narayan Plaza, 26 - A, Chandivali Andheri (E), Mumbai, Maharashtra - 400072, India	Tel: +(91)-(22)-28475505 Fax: +(91)-(22)-28475790
9	Boom Buying Private Limited, Delhi E-986, C. R. Park, New Delhi, Delhi - 110 019, India	Tel: +(91)-(11)- 40560612/40560613/40560614/40560615/40560616 Fax: +(91)-(11)-40560616 Web: www.boombuying.com E-mail: info@boombuying.com
10	Biomax M-2, First Floor, Paradise Tower, Gokhale Road, Naupada, Thane, Maharashtra - 400 602, India	Tel: +(91)-(22)-25386369 Fax: +(91)-(22)-25386369
11	Associated Alcohols and Beverage Ltd. Gram Khodi Post Umaria Chowki, Khandwa Road, Disst-Khargon, Bharwaha, M.P - 451 115, India	Tel: +(91)-(7280)-222151/222047 Fax: +(91)-(7280)-222232
12	Bio Fertz #50/16, 'sreyas', T. R. S. Colony Olavakkode P. O., Palakkad, Kerala - 678 002, India	Tel: +(91)-(491)-31655367

National Committee on Placticulture Applications in Horticulture (NCPAH)

13	Jay Enterprises Shriniketan B Wing, Ground Floor - 8, Dr. Kashibai Navrange Marg, Gamdevi, Mumbai, Maharashtra - 400 007, India	Tel: +(91)-(22)-66644221/32944221
14	A. M. Agro Products 13/60, Main Road, Pandalur, Nilgiris, Coimbatore, Tamil Nadu - 643 233, India	Tel: +(91)-(4262)-220216/220100
15	United Agro Bioteek Pvt. Ltd. 210-213, Dhanlaxami Estate, Gokul Nagar, Thane (West), Mumbai, Maharashtra - 400 063, India	Tel: +(91)-(22)-25446520 Fax: +(91)-(22)-25446516
16	Evayan M/5/25, Anand Flats, Naranpura, Ahmedabad, Gujarat - 380 013, India	Tel: +(91)-(79)-27490128 Fax: +(91)-(79)-26440616/26441770
17	Kadlas Oil Mill Kadlas ,Taluka-Sangola Dist-Solapur, Solapur, Maharashtra - 413 309, India	Tel: +(91)-(2187)-247206 Fax: +(91)-(2187)-247206 Web: www.indiamarrt.com E-mail: kom1111@rediffmail.com
18	Total Agri Care Concern Private Limited 12/A, Netaji Subhas Road, Room No-6,23, Kolkata, West Bengal - 700 001, India	Tel: +(91)-(33)-22135663/22135664 Fax: +(91)-(33)- 22135664 Web: www.indiamart.com/totalagree/ E-mail: totalagric@dataone.in
19	Vrutikhesh Organik Produkts 1/183, Paruvai Road, Appanaickenpatti, Coimbatore, Tamil Nadu - 641 408, India	Tel: +(91)-(422)-2593834/2593835 Fax: +(91)-(422)-2593835 E-mail: manasa_cjp@vsnl.net
20	Hirwal Agrotech Industries Hemraj Complex, Opp. Daulat Chitra Mandir, Main Road, Koregaon, Satara, Maharashtra - 415 501, India	Tel: +(91)-(2163)-222909
21	Surajbala Exports Private Limited, Delhi 902/290, Shalamar Industrial Area, Lane No. 3, New Delhi, Delhi - 110 088, India	Tel: +(91)-(11)-27492547/27492546 Fax: +(91)-(11)-27492546 Web: www.ayurveda_herbal.com E-mail: vinesh@vsnl.com
22	Hansa Exports, Bhuj P.P.C Club Shop No. 4, Ghanshyam Nagar, Bhuj-64100, Gujarat	Tel: +(91)-(2832)-223205 Fax: +(91)-(2832)-223205
23	Chaitanya Group of Industries Behind S. T. Stand, Hanuman Nagar, Malkapur, Dist. Buldana, Buldana, Maharashtra - 443 101, India	Tel: +(91)-(7267)-223239/223435/224966 Fax: +(91)-(7267)-223433/223570 Web: www.chaitanyabiological.com E-mail: chaitchem@rediffmail.com, chaitbio@rediffmail.com
24	Revathi Agri Food Industries Pvt. Ltd. 4, North Usman Road, T. Nagar, Chennai, Tamil Nadu - 600 48, India	Tel: +(91)-(44)-28343642 Fax: +(91)-(44)-28343642
25	Dawn Exports, Coimbatore 21/ A, Kanarajar Street, Kullatthotam Vadavalli, Coimbatore, Tamil Nadu - 641 041, India	Tel: +(91)-(422)-6518379/6579757
26	Essence Bio Tech Private Limited 1/307,chemical industrial Estate,Aroor,Aleppey District, Alappuzha (Allepey), Kerala - 688 534, India	Tel: +(91)-(484)-2348398/6519165 Fax: 0 484 2348398 Web: www.essencebiotech.com E-mail: jibomathew@essencebiotech.com
27	Eco Agro Services Bhugaon, Pune, Maharashtra - 412 008, India	Tel: +(91)-(20)-25380160/22953725

National Committee on Plastics Applications in Horticulture (NCPAH)

28	Tender Sips 212, Deodhar Complex, Indore, Madhya Pradesh - 452 001, India	Tel: +(91)-(731)-2704120 E-mail: n_punitd@yahoo.co.in
29	Swati Enterprises 144 A, Pocket-A, Dilshad Garden, New Delhi, Delhi - 110 095, India	Tel: +(91)-(11)-22135556,22121857 Fax: +(91)-(11)-22121857 E-mail: swatienterprises@yahoo.co.in
30	Garden Blossom 9, C. S. C. Market, Kaka Nagar, Dr. Zakir Hussain Road, New Delhi, Delhi - 110003, India	Tel: +(91)-(11)-24354738 / 65657069 Web: www.gardenblossom.net E-mail: gardenblossom9@yahoo.com
31	Padmavati Enterprises 31, Jaiprakash Society, Opp. New Era School Nizampura, Vadodara, Gujarat - 390 002, India	Tel: +(91)-(265)-2784465 Fax: +(91)-(265)-2784465 Web: www.agroinitiative.com E-mail: info@agroinitiative.com
32	Agrigold Healthcare Pvt. Ltd. 15- A, 1st Floor, Gurmehar Complex, South Model Gram, Ludhiana, Punjab - 141 001, India	Tel: +(91)-(161)-5021097
33	N. R. Chemical Corporation 253, Alkapuri, Dewas, Madhya Pradesh - 455 001, India	Tel: +(91)-(7272)-329983/228610 Fax: +(91)-(7272)-2 409697 Web: www.indiamart.com/nrchemicals E-mail: nrchemicals@yahoo.com
34	Ambika Products 90, 2 nd Floor. Kalyan Vihar, New Delhi, Delhi - 110 009, India	Tel: +(91)-(98)-71695089 Web: www. Indiamart.com/ambikaproducts Email: vishesh_ambikaproducts@yahoo.co.in
35	Bloom Field Plantations Private Limited 198, D-14, 1st Floor, Sector-7, Rohini, Delhi, - 110 085, India	Tel: +(91)-(11)-32499573 Fax: +(91)-(11)-42068312
36	Super Crop Safe Limited C/1/290, G. I. D. C. Estate, Phase-1, Naroda, Ahmedabad, Gujarat – 382330, India	Tel: +(91)-(79)-22823907/32915987 Fax: +(91)-(79).22823907 E-mail: suer_crop_safe@yahoo.com
37	Natural Bio Organic Product, Surat B/2, Golden Plaza, Ankur Cross Road, Surat, Gujarat - 395 008, India	Tel: +(91)-(261)-6564341 Fax: +(91)-(261)-6564341
38	Plantrich 8/489, 2nd Floor, C.S.I Commercial Centre Baker Junction, Kottayam, Kerala - 686 001, India	Tel: +(91)-(481)-2303277 Fax: +(91)-(481)-2563477 Web: www.plantrich.com E-mail: plantrich@plantrich.com
39	Maxeema Biotech Private Limited Plot No.496, Tajpur Road, Off. Sakhej- Bhavla Road Village, Changodar, Taluka Sanand, Dist. Ahmedabad-382210	Tel: 917965129410 E-mail: maxeema_kj@yahoo.com
40	Suriya Farms 21 B/1, C. M. R. Road, Madurai, Tamil Nadu - 625 009, India	Tel: +(91)-(452)-2336411/2465459/2465407 Mob: 0944303641 Web: www.indiamart.com/suriyafarms
41	Marine Bio Products 95 C, Cooperative Colony, Rayapalayam Pudur Chithode, Erode, Tamil Nadu - 638 102, India	Tel: +(91)-(424)-2258589/2258689 E-mail: marineproducts@rediffmail.com

National Committee on Plasticulture Applications in Horticulture (NCPAH)

42	Crop Care Institute 302, Bhagwanti Apartment, 4 Durga Nagar Nawlakha Main Road, Indore, Madhya Pradesh - 452 001, India	Tel: +(91)-9302139927 Web: indiamarft.com/cropcare.com E-mail: cropcareinstitute@yahoo.com
43	Alamu Coco Peats No. 7, A. V. G. Layout, P. O. Box No. 4804, Sundarapuram (P. O.), Coimbatore, Tamil Nadu - 641 024, India	Tel: +(91)-(422)-2673175/2670982 Fax: +(91)-(422)-2670982 Web: www.unitedcoolingtower.com E-mail: coolingtower@gmail.com
44	D. D. Enterprises 501, Yugay Residency, Erandwane Near Hotel Sweekar, Pune, Maharashtra - 411 004, India	Tel: +(91)-(20)-25450151 Fax: +(91)-(20)-25450151 E-mail: ddent69@hotmail.com
45	Agri Biotech A/O E-11/14, Hauz Rani, Malviya Nagar, New Delhi, Delhi - 110 017, India	Tel: +(91)-(11)-26675018
46	Sunrays Marketing Private Limited S. C. O. 43, Second Floor, Sector-41D, Chandigarh, Chandigarh - 160 036, India	Tel: +(91)-(172)-5047001
47	Adhya Agro Products Trading Co. Private Limited Brahmin Aali, At. Post, Nandgaon Stn, Boisar, Tal, Plaghar, Dist , Thane, Palghar, Maharashtra - 401 501, India	Tel: +(91)-(2525)-288030
48	RBM Trade Care Pvt Ltd. G-16, Bahubali Complex, Kalanala, Bhavnagar, Gujarat - 364 001, India	Tel: +(91)-(278)-2426188 Fax: +(91)-(278)-2426166 Web: www.marine-care.com E-mail: info@marine-care.com
49	Shri R.R.Shah, Managing Director Vardhaman Fertilizers & Seeds Pvt. Ltd., Pratibha Towers, 18A/2B, Third Floor, Pune-Mumbai Road, Wakadewadi, Pune- 411003, Maharashtra, India	Tel: (O): 020-25810898, Mob: 9422322715, @: 020-2543960 Email: teknodhan@vsnl.net Web: www.vardhamanfertilizers.com
50	Solufeed Plant Products & Services Pvt. Ltd. Dr Savkar Accident Hospital, Lokmanya Nagar, Gangapur Road, Nasik- 422002	Tel: 0253-2576254 Fax - 0253- 2316626 E-mail: solufeed_nsk@sancharnet.in
51	DCM Shriram Consolidated Ltd 5th Floor, Kanchanjunga Building, 18, Barakhamba Road, New Delhi-110001, India	Tel: 011 23316801 Fax: 011 23318072 Email: dsc1@dscl.com Web: www.dscl.com

Disclaimer: Though this bulletin is compiled based on information gathered on best of our efforts keeping the interest of the readers to know about the fertigation techniques and its benefits in crop production.NCPAH reserve the right and anybody want to publish may seek prior approval. We may not accept any liability/damage or loss for the result for any action taken on the basis of this information.