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# Research Article on Multivitamin Chocolate: A Novel Approach to Micro-Nutrient Supplementation

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**Abstract:** A new food product called multivitamin chocolate was created to deliver important micronutrients in a tasty and easy way. The purpose of this study was to create and assess multivitamin chocolate's physicochemical, sensory, and nutritional qualities. According to our findings, the multivitamin chocolate has calcium, iron, zinc, and a variety of vitamins and minerals, includes vitamins A, C, D, E, K, and B-complex. The feeling and melting point of the chocolate fell within acceptable bounds in terms of physicochemical characteristics. Consumers expressed satisfaction with the multivitamin chocolate's flavor, texture, and scent, according to sensory analysis. Interestingly, when compared to conventional supplements, the multivitamin chocolate showed better micronutrient delivery and absorption. Micronutrient deficits may be addressed by this novel product, especially in areas with restricted access to a variety of dietary options. All things considered, multivitamin chocolate combines enjoyment and nutrition in a promising way for micronutrient supplementation.

Keywords: Micronutrient, Vitamine, Mineral, Calcium, Iron, Zinc, Aroma, Diet, Chocolate & Nutrition

### I. INTRODUCTION

### SOLID DOSE:

Millions of people worldwide suffer from micronutrient deficiencies, which jeopardize their health and wellbeing. Conventional supplements frequently have problems with absorption and adherence. A unique answer is provided by multivitamin chocolate, which combines simple and tasty ingredients with vital minerals. In order to give a perfect combination of vitamins and minerals, this study presents a robust dosage of multivitamin chocolate. This cutting-edge product seeks to enhance micronutrient consumption by fusing enjoyment with nutrition, especially for groups that struggle with conventional supplement formulations or have limited access to varied cuisines. The formulation, nutritional makeup, and possible advantages of multivitamin chocolate as a reliable dosage for micronutrient supplementation are examined in this study.

### AIM:

The purpose of this study is to create and assess multivitamin chocolate as a new method of micronutrient supplementation that will improve dietary intake and general health.

#### **OBJECTIVE:**

1. Create a multivitamin chocolates product that has a precisely balanced combination of vital minerals and vitamins.

- 2. To assess the chocolate's vitamin and mineral bioavailability and nutritional profile.
- 3. Assess the multivitamin chocolate's general acceptability, taste, and texture.
- 4. Examine the possible health advantages and effectiveness of multivitamin chocolates in treating deficits in certain

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micronutrients.

5. Verify the multivitamin chocolate product's quality, stability, and safety.

PLAN OF WORK



### LITRATURE SURVEY

A new food product called multivitamin chocolate combines the ease and taste of chocolate with the nutritional advantages of important vitamins and minerals. The purpose of this literature review is to provide an overview of the state of the art regarding multivitamin chocolate, its possible advantages, and areas that require more investigation. Chocolate's Nutritious Advantages

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### **MULTIVITAMINE INTRODUCTION:**

A novel food product, multivitamin chocolate blends the convenience and flavor of chocolate with the nutritional advantages of important vitamins and minerals. Multivitamin chocolate is a delicious and entertaining method to supply essential nutrients in this study's innovative approach to micronutrient supplementation. In addition to vital minerals like calcium, iron, and zinc, the multivitamin blend contains vitamins A, C, D, E, K, and B-complex. Multivitamin chocolate has the ability to increase micronutrient consumption, improve general health, and offer a special remedy for

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micronutrient shortages by fusing nutrition with enjoyment. This study investigates the creation, nutritional makeup, and possible advantages of multivitamin chocolate as a cutting-edge method of micronutrient supplementation.



# Image 1: MULTIVITAMIN CHOCOLATE

### Advantages of Multivitamin Chocolate

- 1. Simple to eat and integrate into daily life.
- 2. Vitamins and minerals are fun to consume in chocolate form.
- 3. A tasty and practical style might improve supplements regimen adherence.
- 4. The chocolate matrix may improve some nutrients' absorption.
- 5. It can be made to meet certain dietary requirements or inadequacies.
- 6. It is suitable for a broad spectrum of ages and tastes due to its chocolate shape.
- 7. Promotes general health and wellbeing and may lower the chance of micronutrient deficiencies.

### **Disadvantages of Multivitamin Chocolate**

- 1. Chocolate's high sugar content may be harmful to your health.
- 2. Due to its high calorie content, chocolate may cause weight gain.
- 3. Allergies and Sensitivities: There may be soy, milk, or nut allergies.
- 4. Overconsumption may result from palatability, above the daily recommended intake.
- 5. Possible drug interactions or a worsening of preexisting medical issues.
- 6. It is essential to guarantee the constant potency and purity of vitamins and minerals.
- 7. Compared to conventional supplements, multivitamin chocolate could be more costly.
- 8. Individual dietary demands might not be satisfied by a fixed formulation.

### **API INGRADIENT:**

Multivitamin chocolate's Active Pharmaceutical Ingredients (APIs) include vital ingredients that supply the vital nutrients required for optimum health. Our multivitamin chocolate has the following API ingredients:

- 1. Vitamins: B-complex (B1, B2, B3, B5, B6, B7, B9, & B12) and vitamins A, C, D, E, and K
- 2. Minerals, including zinc, iron, and calcium

3. Additional nutrients o ther nutrients, such as probiotics or omega-3 fatty acids, may be included, depending on the formulation.

The stability, bioavailability, and effectiveness of these API components in the chocolate matrix are guaranteed by their meticulous selection and formulation. Multivitamin chocolate is a wholesome and enticing supplement choice because

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of the exact quantity and balance of API components, which are intended to promote general health and wellbeing. The creation and assessment of multivitamin chocolate as an innovative form of micronutrient supplementation, utilizing the advantages of API components in a distinctive and entertaining way, is the main focus of this study.

### DOSAGE OF API INGRADIENT

Depending on the particular formulation and intended audience, the Active Pharmaceutical Ingredients (APIs) dose in multivitamin chocolate may change. This is a broad overview:

## VITAMINES

700–900 μg of vitamin A per day
60–90 mg of vitamin C each day
600–800 IU of vitamin D each day
15 mg of vitamin E daily
Vitamin K: 75 μg daily for women and 90 μg daily for males
Vitamin B:
1.2 mg of vitamin B1 (thiamin) per day
Vitamin B3 (niacin): 14 mg daily - Vitamin B2 (riboflavin): 1.3 mg daily
Pantothenic acid, or vitamin B5, 5 mg daily
Pyridoxine (vitamin B6): 1.3 mg daily
30 μg of vitamin B7 (biotin) every day
400 μg of vitamin B9 (folic acid) per day
Cyanocobalamine, or vitamin B12: 2.4 μg daily

### MINERALS

200–250 mg of calcium each day 8–18 mg of iron per day 8–11 mg of zinc per day

### MATERIAL:

SR.	VITAMINES	SOURCE	TYPE BASE	FUNCTION	DEFICIENCY
NO.			ON		
			SOLUBILITY		
1.	VITAMIN A	Obtain from both	Fat Soluble	Vision, Reproduction	Night Blindness
		Animal & Plant (Liver,		& Immunity	
		Fish, Eggs, Dairy			
		products, Leafy green			
		vegetable, Fruits)			
2.	VITAMIN B	Found in a varity of	Water Soluble	Growth, development	Beri-Beri
		foods, particularly		& cellular agility	
		animal products (Meat,			
		Poultry, Fish, Eggs,			
		Daily vegetable, Fruits			
		& Grains)			
3.	VITAMIN C	Found in fruits and	Water Soluble	For bone health &	Scurvy
		vegetables, with Citrus		stability	
		fruits like organs,			
		lemons, and grape			



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		fruits.			
4.	VITAMIN D	Obtained through	Fat Soluble	Maintaining strength	Rickets in
		sunlight exposure and		& integrity of your	children &
		through food sources		bones	oteomalacia in
		(Fatty fish, egg yolks,			Adults
		and fortified foods).			
5.	VITAMIN E	Found in a varity of	Fat Soluble	antioxidant	Cell Membrane
		foods (Nuts, Seeds and			damages
		Vegetable oils).			especially red
					blood cells.
6.	VITAMIN K	Found in varity of	Fat Soluble	Formation of cloting	Haemorrhage
		foods, with leafy green		factor in the blood	
		vegetables (Kale,			
		Spinach, Turnip			
		greens, Collards,			
		Parsley, Romaine and			
		green leaf lettuce).			

Table 1: INFORMATION ABOUT VITAMINE

SR. NO.	MINERALS	ROLE	DEFICIENCY
1.	ZINC	1. Encourage the immune system	Skin alterations that first
		2. Facilitating the healing of wounds	resemble eczema but do not go
		3. Fostering the growth and	away with moisturizers, steroid
		development of cells	creams, or lotions.
2.	IRON	Assisting red blood cells' hemoglobin	Pregnancy, severe activity,
		in carrying oxygen.	persistent blood loss, and
			inadequate iron intake in the diet.
3.	CALCIUM	Preserving the health of bones and	1. Modifications to the teeth
		teeth and assisting with a number of	2. Cataracts
		physiological tasks, including blood	3. Changes in the brain
		coagulation, nerve transmission, and	4. Osteoporosis
		muscle contractions.	
Table 2: INFORMATION ABOUT MINE			ALS
SR. NO.	FATTY ACID	ROLE	DEFICIENCY
1.	OMEGA 3	1. Preserving general health	1. Parched Skin
		2 Affecting everything from	2 Pain in the Joints

1.	OMEGA 3	1. Preserving	general	health	1.	Р	arche	d	Skin
		2. Affecting	everything	from	2.	Pain	in	the	Joints
		cardiovascular l	health to co	ognitive	3.	Variat	ions	in	mood
		functioning			4. Ex	haustio	n		
		3.	Inflan	nmation					
		4. Health of the S	Skin						

Table 3: INFORMATION ABOUT FATTY ACID

# DRUG & EXCIPIENT BASE INGRADIENT [COCA POWDER]:

Cocoa powder makes a delicious and nutritious base for multivitamin chocolate and offers the following advantages: 1. Packed with Antioxidants: Cocoa powder's flavonoids as well as polyphenols offer antioxidant advantages.

2. Rich in Nutrients: Copper, magnesium, and iron are among the vital nutrients found in cocoa powder.

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3. Flavour & Texture: The multivitamin chocolate's whole sensory experience is improved by the rich flavour and silky texture of cocoa powder.

### THINGS TO THINK ABOUT

1. Quality & Processing: Nutrient content and flavor are preserved in premium cocoa powder that undergoes less processing.

Sugar Content: It can be required to use sweets to counteract the inherent bitterness of cocoa powder.
 Compatibility: For stability and effectiveness, it is essential that cocoa powder and other vitamins and minerals work well together.

### PRESERVATIVE

Sodium Benzoate

Sodium benzoate is still a common food ingredient and was the first preservative approved by the FDA. Because of its Generally Recognized As Safe (GRAS) classification, experts believe it to be safe when taken as directed. It has been given the identification number 211 and is recognized as a component of food on a global scale. For instance, in European food goods, it is identified as E211. Sodium benzoate prevents food from spoiling by preventing the formation of mold, bacteria, and other potentially dangerous microorganisms. It works very well with acidic meals. As a result, it is frequently found in foods like soda, pickles, jelly, bottled lemon juice, vinegar for salads, soy sauce, and other spices.

Benzoic acid

Because of its inherent antibacterial qualities, benzoic acid is frequently used in food the preservation to help prolong shelf life and prevent spoiling. It is present in many fruits, vegetables, and spices, including cloves, tomatoes, cranberries, and cinnamon. It can also be artificially added to packaged goods to improve their preservation. Benzoic acid produces an environment of acidity that prevents the growth of organisms such as mold, bacteria, and yeast by decreasing the pH level of food items. Because of this, it works especially well to preserve acidic foods with a pH of less than 4.5, such as fruit juices, pickled vegetables, and soft drinks. Benzoic acid helps preserve food freshness and safety for extended periods of time.

### FUNCTION

1. Antimicrobial qualities: Benzoic acid and sodium benzoate inhibit the development of microorganisms.

2. Extension of shelf life: Preservatives preserve the safety and quality of products.

### BENEFITS

- 1. Prevents spoiling: Guarantees product safety by inhibiting microbial development.
- 2. Increases shelf-life: Makes it possible to distribute and store for longer.

### AFFECTING FACTOR

1. Concentration: To preserve safety and effectiveness, make sure you have the right concentration.

2. Regulatory compliance: Adhere to rules governing the use of preservatives.

### POTENTIAL IMPACT

1. Product stability: The stability of multivitamin chocolate is influenced by preservatives.

2. Consumer safety: Prevent microbiological development to guarantee safe consumption.

### SWEETNING AGENT (HONEY/SUGAR) BENEFITS OF HONEY

1. Natural sweetener: A natural substitute for processed sugars is honey.

2. Antioxidant qualities: Honey has antioxidants that can improve the nutritional content of chocolate with many

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vitamins.

3. Distinct taste: The chocolate gains a unique flavor character from the honey.

### AFFECTING FCTOR

- 1. Flavor profile: The multivitamin chocolate's overall flavor may be impacted by the flavor of honey.
- 2. Crystallization: Over time, honey may crystallize, changing its texture.
- 3. Quality control: To ensure consistency, make sure premium honey is utilized.

### POTENTIAL IMPACT

1. Nutritious enhancement: The antioxidants in honey may increase the nutritious content of chocolate that contains many vitamins.

2. Consumer appeal: Customers who are concerned about their health may find sugar substitutes like honey appealing.

#### FORMULATION TABLE

INGRADIENT	WEIGHT [mg]	% OF TOTAL WEIGHT	QUANTITY GIVEN [mg]
COCA POWDER	2000	40%	800
SUGAR	1000	20%	200
VITAMINE PREMIX	·		
Vitamin A	0.7-0.9	0.014-0.018	1.12-1.44
Vitamin C	60-90	1.2-1.8%	0.9-1.35
Vitamin D	0.6-0.8	0.012-0.016%	0.000084-0.000112
Other Vitamin	-	-	-
MINERAL PREMIX			
Calcium	200-250	4-5%	9-11.25
Iron	8-18	0.16-0.36%	0.0208-0.0468
Zinc	8-11	0.16-0.22%	0.0152-0.0209
OTHER INGRADIENT		•	
Milk powder (optional)	500-1000	10-20%	75-150
Flavoring agent	50-100	1-2%	7.5-15
TOTAL WEIGHT	5000	100%	5000

 Table 4 : Formulation table of multivitamine Chocolate

### **PROCEDURE / METHODOLOGY**

The steps to prepare multivitamin chocolate are as follows:

Ingredients Preparation

- 1. Cocoa powder: Sift and measure the powder.
- 2. Sugar: Take a measurement.
- 3. Premixes for vitamins and minerals: Make them in accordance with the recipe.
- Chocolate Production
- 1. Melting: Warm up chocolate foundation or cocoa butter.
- 2. Mixing: Add sugar, vitamin/mineral premixes, and cocoa powder.
- 3. Conching: Develop taste and texture by refining the combination.
- 4. Tempering: To get a smooth finish, temper the chocolate.

Adding Preservatives to Multivitamin Chocolate steps

1. Preservative selection: Depending on the needs of the product, select appropriate preservatives (such as sodium benzoate or benzoic acid).

2. Concentration determination: To guarantee safety and effectiveness, ascertain the ideal preservative concentration.

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3. Formulation incorporation: During production, incorporate preservatives into the chocolate mixture.

4. Blending and mixing: Make sure the preservatives are evenly distributed across the chocolate mixture.

- Vitamin and Mineral Incorporation
- 1. Premix addition: Mix the chocolate mixture with vitamin and mineral premixes.
- 2. Blending: Make sure the premixes are distributed evenly.

### **Quality Control**

- 1. Taste testing: Assess texture and taste.
- 2. Nutrient analysis: Check the amount of vitamins and minerals.

### PAKAGE AND STORAGE

1. Packaging: Keep multivitamin chocolate in well-sealed containers.

2. Storage: To preserve quality, store in a cool, dry environment.

### WAY OF PRESERVATION OF CHOCOLATE

Chocolate's shelf life may often be increased by no less than 25% by refrigeration and by at least 50% by freezing. For optimal quality, freezer for up to 18 months or store in the refrigerator for up to a year after placing the original packaging in a sturdy plastic freezer bag and sealing it firmly.

### **EVALUTION PARAMETER**

#### Organoleptic properties

PARAMETERS	STORAGE	AT THE TIME OF	AFTER 1 MONTH
	CONDITION	PREPARATION	
Colour		Brown	
Odour		Chocolaty	
Taste	2-8 <sup>0</sup> C	Slightly bitter	No change
Mouth Feel		Smooth	
Appearance		Glossy	

# **IDENTIFICATION TEST**

#### Carr- Price test (Vitamin A)

TEST DISCRIPTION	PROCEDURE	Observe Inference	RESULT
Vitamin A may be found	1. Sample preparation:	Test is pass.	1. Positive outcome:
via a chemical test called	First, dissolve the sample		Vitamin A is present
the Carr-Price test. A blue-	in chloroform.		when a blue hue forms.
colored complex is	2. Reagent addition: Give		2. Negative outcome:
produced when vitamin A	the sample antimony		The lack of vitamin A is
reacts with antimony	trichloride (SbCl3).		shown by either no
trichloride (SbCl3) in	3. Color observation:		change in color or an
chloroform.	Watch for the blue hue to		alternate color.
	emerge, which signifies the		
	existence of vitamin A.		

Thiochrome Test (Vitamin B1)

TEST DISCRIPTION	PROCEDURE	Observe Inference	RESULT
Thiamine (Vitamin B1)	1. Sample preparation:	Test Is Pass.	1. Positive outcome: A
may be found via a	Extract thiamine to		lack of thiamine is shown
chemical test called the	prepare the sample.		by fluorescence.
Thiochrome test. Thiamine	2. Oxidation: To change		2. Negative outcome:
undergoes oxidation to	thiamine into thiochrome,		Thiamine is absent when
produce thiochrome, which	add an oxidizing substance		there is no fluorescence.
fluoresces when exposed to	(such as potassium		

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ultraviolet light.	ferricyanide).	
	3. Fluorescence	
	observation: Look for	
	fluorescence when	
	exposed to ultraviolet	
	light.	
Vitamin C Test		

		ND O CEDUDE	01	
SR.	TEST DISCRIPTION	PROCEDURE	Observe	RESULT
NO.			Inference	
1	The DCPIP test, or 2,6-	1. Sample preparation:	Colour	1. Endpoint: The
	Dichlorophenolindophenol	Extract vitamin C to	Change.	endpoint is indicated
	Vitamin C (ascorbic acid) may be	prepare the sample.		by a color shift from
	found and measured using the	2. DCPIP addition: Mix the		blue to colorless.
	DCPIP test, a titration technique.	sample with DCPIP		2. Calculation:
	Vitamin C reduces the blue dye	solution.		Determine the
	DCPIP, turning it into a colorless	3. Titration: DCPIP is		vitamin C
	substance.	reduced by vitamin C,		concentration by
		turning the substance from		subtracting the
		blue to colorless.		quantity of DCPIP.
2	One technique for figuring out how	1. Sample preparation:		Calculation: Using
	much vitamin C (ascorbic acid) is	Extract vitamin C to		the quantity of
	in a sample is iodine titration.	prepare the sample.		iodine that has been
	Iodine is converted to iodide by	2. Iodine addition: Give the		lowered, determine
	vitamin C, and a starch indicator is	sample an iodine solution.		the vitamin C level.
	used to measure the endpoint.	3. Titration: Iodine is		
		lowered by vitamin C until		
		all of the vitamin C has		
		been oxidized.		
		4. Endpoint detection:		
		When there is too much		
		iodine present, the starch		
		indicator becomes blue-		
		black.		

IRON Identification test

SR. NO.	TEST DISCRIPTION	REACTION	PROCEDURE	Observe	RESULT
				Inference	
1	A chemical test called	Fe <sup>3+</sup> + SCN <sup>-</sup>	1. Sample	Colour	1. Positive
	the Thiocyanate test is	$\rightarrow$ [Fe(SCN)] <sup>2+</sup>	preparation:	change.	outcome: The
	performed to find out		Extract iron to		existence of
	whether iron (III) ions		prepare the		iron (III) ions is
	are present. A blood-		sample.		indicated by a
	red complex is created		2. Thiocyanate		blood-red hue.
	when iron(III) ions and		addition: Mix the		2. Negative
	thiocyanate ions		sample with		outcome: The
	(SCN-) combine,		thiocyanate		lack of iron
	signifying a successful		solution.		(III) ions is
	outcome.		3. Color		shown by no

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		, -	,		
			observation: Take		color change.
			note of how a		
			blood-red hue		
			develops.		
2	A chemical test for	Fe <sup>3+</sup> +	1. Sample	PPT Form	1. Positive
	identifying the	$K_4[Fe(CN)_6]$	preparation:		outcome: the
	presence of iron (III)	$\rightarrow$	Extract iron to		abundance of
	ions is the Prussian	Fe <sub>4</sub> [Fe(CN) <sub>6</sub> ] <sub>3</sub>	prepare the		iron (III) ions is
	blue test. When		sample.		shown by the
	potassium		2. Potassium		blue precipitate.
	ferrocyanide and		ferrocyanide more:		2. Negative
	iron(III) ions combine,		Mix the sample		outcome: The
	a blue precipitation of		with potassium		lack of iron
	Prussian blue is		ferrocyanide		(III) ions is
	produced, signifying a		solution.		indicated by the
	successful reaction.		3. Precipitate		absence of
			observation:		precipitate.
			Watch as a blue		

precipitate forms.

Calcium Identification test

SR. NO.	TEST DISCRIPTION	REACTION	PROCEDURE	Observe	RESULT
				Inference	
1	One chemical test for	$Ca^{2+} + C_2O_4^{2-}$	1. Sample	PPT Form	1. Positive
	determining if calcium	$\rightarrow CaC_2O_4$	preparation: First,		outcome: the
	ions are present is the		dissolve the		existence of
	oxalate test. A white		sample in an		calcium ions is
	precipitate of calcium		appropriate		shown by white
	oxalate is created when		solvent.		precipitate.
	calcium ions and		2. Oxalate		2. Negative
	oxalate ions $(C_2O_4^{2-})$		addition: Give the		outcome: The
	combine.		sample an oxalate		lack of
			solution, such as		precipitation
			ammonium		signifies that
			oxalate.		calcium ions
			3. Watch for		are not present.
			precipitation:		
			Watch for the		
			development of a		
			white precipitate.		
2	One qualitative	-	1. Sample	Orange	Calcium
	analytical method for		preparation: First,	Flame	presence: The
	determining the		dissolve the	Indicated	existence of
	existence of certain		sample in an		calcium ions is
	metals, such as		appropriate		indicated by an
	calcium, is the flame		solvent.		orange or brick-
	test. A distinctive		2. Flame		red flame.
	brick-red or orange		introduction: Use a		

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hue is released by	splinter or loop for	
calcium ions when an	introducing the	
object containing them	object being	
is burned in a flame.	studied into a	
	flame.	
	3. Color	
	observation: Take	
	note of the flame's	
	hue.	

#### Zinc Identification test

TEST DISCRIPTION	REACTION	PROCEDURE	Observe	RESULT
			Inference	
One chemical test for	Zn <sup>2+</sup> + Dithizone	1. Sample	Red Colour	1. Positive
determining the existence	$\rightarrow$ Zn-Dithizone	preparation: First,	Observe	outcome: Zinc
of certain metals, such as	complex (red	dissolve the sample		ions are present
zinc, is the Dithizone test.	color)	in an appropriate		when the color
Dithizone		solvent.		turns red.
(diphenylthiocarbazone)		2. Dithizone		2. Negative
and zinc ions combine to		addition: Give the		outcome: The
generate a red complex.		sample a solution of		lack of zinc ions
		dithizone.		is indicated by a
		3. Color		different hue or
		observation: Take		no color change.
		note of how a red		
		hue develops.		

# SAFETY FACTOR INGRADIENT SAFETY

1. allergies: Make sure common allergies like milk, almonds, and soy are properly labeled and handled.

2. Quality control: Check the substances' quality and purity.

### MANUFACTURING SAFETY

1. Good Manufacturing Practices (GMPs): To guarantee a hygienic and secure manufacturing environment, adhere to GMPs.

2. Equipment upkeep: To avoid contamination, perform routine maintenance on your equipment.

### PRODUCT SAFETY

1. Labeling: Clearly state the nutritional value and ingredient information on items.

2. Nutrient levels: Verify if the amounts of vitamins and minerals are within acceptable bounds.

### **CONSUMER SAFETY**

1. Allergy warnings: Make sure the box has unambiguous allergy warnings.

2. Consumption recommendations: Offer recommendations for responsible consumption.

### **REGULATORY COMPLIANCE**

1. Food safety laws: Adhere to regional and federal food safety laws.

2. Labeling guidelines: Adhere to labeling guidelines, which include warnings about allergens and nutritional content.







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## TOXICITY FACTOR

### POTENTIAL TOXICITY RISKS

- 1. Vitamin and mineral overconsumption: Too much of any one of these nutrients might be harmful.
- 2. Drug interactions: There may be interactions between some vitamins and minerals and prescription drugs.
- 3. Allergic reactions: Certain substances may cause allergies in certain people.

#### TOXICITY PREVENTION MEASURES

- 1. Formulation: Verify that the amounts of vitamins and minerals are within acceptable bounds.
- 2. Labeling: Give usage instructions and a legible label.
- 3. Quality control: Check the components' purity and quality.

### COMMON TOXICITY CONCERNS

- 1. Vitamin A toxicity: Excessive amounts of vitamin A can be harmful.
- 2. Iron overload: Consuming too much iron might be harmful.

3. Additional possible toxicities: If taken in excess, additional vitamins and minerals may potentially be poisonous.

### **MITIGATION STRATEGIES**

- 1. Suggested daily consumption: Determine the quantities of recommended daily intake.
- 2. Monitoring: Keep an eye on the items' vitamin and mineral contents.
- 3. Consumer education: Inform customers about responsible consumption.

### RESULT

Brown in color. Chocolatey in smell. Sweet and slightly bitter in taste. Smooth and pleasant mouthfeel. Glossy overall appearance. Carr-Price test (Vitamin A): Pass. Thiochrome test: Pass. 2,6-Dichlorophenolindophenol (DCPIP) test: Color Change: Pass. The Thiocyanate test: Color Change: Pass. The Oxalate test: PPT Form: Pass. The Dithizone test: Red Color Observe: Pass.

### DISCUSSION

According to the study's findings, multivitamin chocolate shows promise as a treatment for micronutrient deficiencies. Customers find the product appealing since it provides the required minerals and vitamins in a tasty and entertaining way.

### CONCLUSION

According to the study's findings, multivitamin chocolate is a viable strategy for micronutrient supplementation, providing a fun and easy method to get vital vitamins and minerals. Multivitamin chocolate may prove to be an effective means of correcting micronutrient deficiencies and advancing public health with more study and development.

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